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Volume 15 Number 1

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The Physiotherapy Review

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The Mechanics of the Function of the Organs of the Upper Abdomen

Joel E. Goldthwait, M. D., F. A. C. S.

The upper portion of the abdomen, that part which is above the umbilicus and the tips of the lower ribs, not only contains many of the important organs of the body, but is the region to which the symptoms often are referred, and for which the physician is consulted. It is also the region containing the organs which must be involved with diseases which manifest themselves elsewhere. Since no portion of the body contains more individual organs of importance than this, and since so much attention is given it by both the physician and surgeon, with results certainly not always satisfactory, it seems not unreasonable to study the region from a somewhat different point of view than is common.

In this area should be the liver, stomach, duodenum, spleen, pancreas, kidneys, suprarenal bodies, the upper portion of the colon, the large collections of sympathetic ganglia, and many of the large blood vessels. These organs fill the space under the diaphragm extending downward at the sides to the lower border of the ribs and are closely related, so that the position of one or the support of one is dependent upon the position or support of the others.

At the back, serving partly as support for the organs and also for their protection, is a mass of fat held together with much fibrous tissue. In this the kidneys and suprarenal bodies are imbedded and it serves to protect the blood vessels as well as the posterior sympathetic ganglia from injury.

The position of the organs as here described and shown in the text books of anatomy does, of course, exist at times, but such findings are very rare with the chronic patient as well as with the acute conditions of which the writer has knowledge. Hence this discussion seems worthy.

In the attempt to control such diseases as the various arthritides or the progressive paralyses, so little relief came from pathologic or bacteriologic methods that study of the actual anatomy present with the individual was made with the expected function once the anatomy was understood. The results from this have been gratifying not only with these diseases but with many other chronic conditions.

In the first place, while the location of the organs as stated, and at times in health, does exist, it is rarely seen with our patients. To be of the text-book structure the body must be used fully erect so that the dome of the diaphragm is high, being held in place largely by the deep cervical fascia which is attached at the sides of the low cervical spine and extends to the top of the diaphragm through the pericardium. With this the ribs must be held at a point midway between full inspiration and full expiration and form a basket-like support to hold the abdominal organs in place at the sides and back. Under such conditions the lateral spinal spaces in the upper abdomen are filled with the liver and stomach, as well as the kidneys and the suprarenal bodies. In front of the kidneys and extending across the spine from one side to the other is the pancreas, and the plane of the posterior surface of this organ is nearly straight, Fig. 1.

In order that the conditions as here described may exist, the body must be used as is shown in Fig. 2. In this the diaphragm is well up, having its upper border between the eighth and ninth ribs at the back, with the anterior attachment from three inches to four inches higher than the posterior. In this position the upper half of the kidneys rests against the posterior part of the diaphragm or above the edge of the last ribs. This condition, as described in the text books, and which can be checked with modern x-ray study, is apparently the best that is known for health and general vigor.

As the chronic patient is studied, however, and many patients having acute symptoms, this condition or position of the parts does not exist. The ribs are sagged, the diaphragm is low and the space for the organs in the upper abdomen does not exist. This is easily shown by x-ray study, as well as by dissection, and in Fig. 3, the diaphragm is down to the last rib, so that the space under the ribs no longer exists and the organs are forced to assume other positions. In the lateral view of this region at times the antero-posterior diameter of the lower chest is not greatly reduced, the diaphragm being stretched straight across, the anterior attachment being at the same level as the posterior. At other times the lowering of the ribs is greater, the antero-posterior diameter is much less than normal, and under such conditions the viscera are forced downward still more, Fig. 4. Under such conditions the space in the upper abdomen under the ribs no longer exists, and the organs of this region must be forced downward.

The more these abnormal positions are studied, the more understandable are the disturbances of the physiology so commonly met. With conditions as must exist when the parts are sagged, as here shown, Fig. 5, the liver is forced downward and at such times it rotates, the right side dropping down more than the left, the whole organ moving to the right side. In this the axis of the organ instead of being horizontal, is often vertical,

Boston, Massachusetts.

Read at the Meeting of the Orthopaedic Section of the American Medical Association held in Cleveland, Ohio, June, 1934.

XUM

Figs. 5 and 6. In a recent study of this feature (through the kindness of the Anatomic Department of the Harvard Medical School), of three subjects examined, it was found that in two the liver had not only rotated and sagged as described, but had formed a pouch behind the crest of the ilium in which the lower part of the liver rested. With such change of position, disturbances of the function of the organ must occur, while the drainage of the gall bladder should be more difficult than is normal.

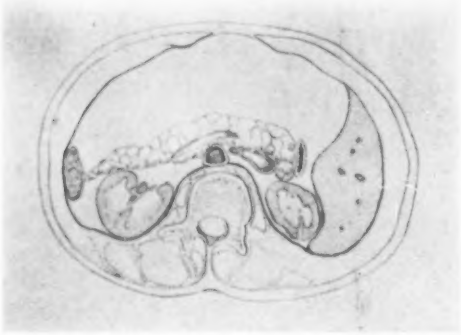


Fig. 1. Cross section of the upper abdomen showing the relative normal position of kidneys, liver, pancreas, and spleen. Notice in this how completely the lateral spinal spaces are filled with solid viscera and that the posterior surface of the pancreas is nearly straight or horizontal.

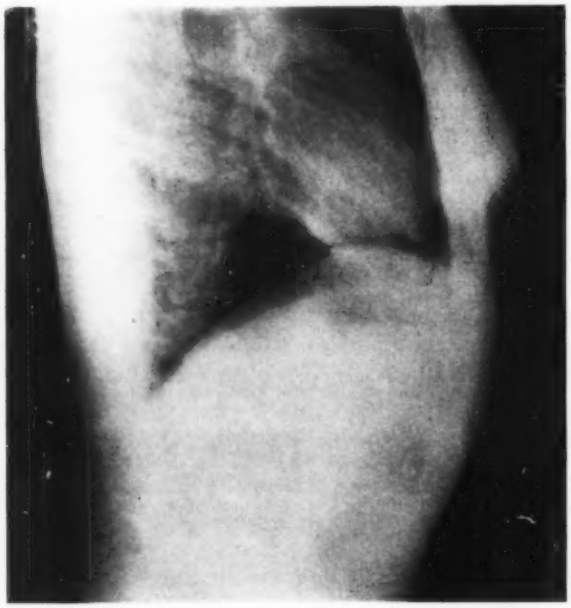


Fig. 2. Lateral view of the body of a well poised individual with downward and forward inclinaton of ribs of about 30°, the diaphragm high, with the anterior attachment 3" or 4" above the posterior attachment, with adequate space in the upper abdomen for all of the viscera that should be so located.

The stomach must be low, and if it is of the slender tubular type, it will become the fish-hook, or J-stomach, with the lower border well down in the pelvis, Figs. 5 and 6. Since the duodenum cannot sag in proportion, the difference between the stomach level and the duodenal level must make drainage of the stomach difficult. With this more or less well recognized type of stomach it should be remembered as well as with the marked

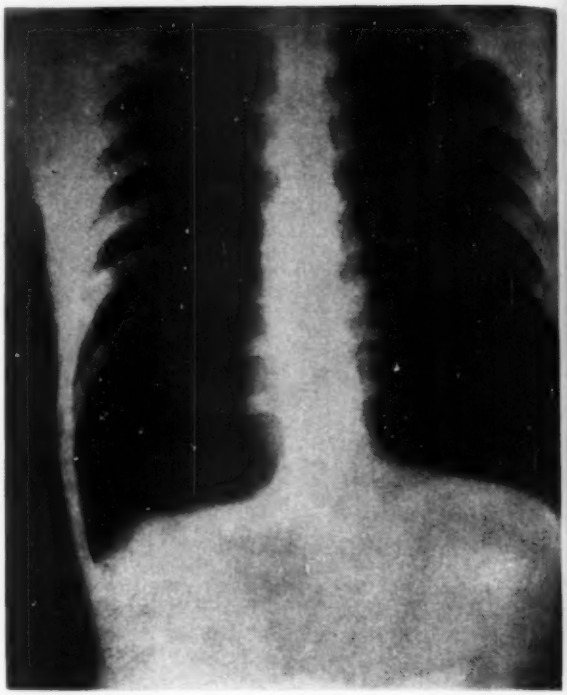


Fig. 3. Extreme ptosis of the heart and diaphragm, the level of the diaphragm being at the level of the last rib at the back, with naturally no space under the ribs, or in the normal upper abdomen, for the viscera. With the diaphragm in this position all of the viscera must be crowded downward at least 3" or 4".

sag of the liver that neither can occur without the sag of the ribs and diaphragm.

With such position the kidneys, which should rest with their upper halves against the posterior portions of the diaphragm, are naturally forced forward and downward. A diaphragm which has lost its dome with the anterior attachment low, makes this inevitable, as well as forcing the suprarenal bodies into abnormal position. This is increased by the fact that with the body sag, the ribs not only incline downward more than is normal, but backward as well, thus deepening the lateral spinal spaces in the upper abdomen.

With the displacement of the kidneys as well as the inevitable absorption of the retro-peritoneal fat, the support of the ends of the pancreas, the "head" and the "tail," is lost so that both of these portions drop backward into the lateral spinal spaces, the posterior surface of the organ becoming saddle-shaped instead of nearly straight, Fig. 7. This, together with the pressure upon these portions that must come from the displaced liver and stomach, must exert definite drag upon the middle portion as it crosses the spine, and under such conditions it is hardly reasonable to expect the normal function.

The spleen, with the sagged ribs and diaphragm, must be forced into a different position than is normal, with at times a distinct rotation or twist of the axis of the organ. Under such conditions it is hardly reasonable to expect the normal function, and it is not improbable that some of the little understood blood disturbances may be due to such mechanical features. In a recent study of twelve subjects, (through the kindness of the Anatomic Department of the Harvard Medical School), six showed the spleen in the extreme posterior part of the lateral spinal space, with the outer surface facing backward, representing a change of the axis of the organ

Fig. 4. A lateral view showing the extreme sag of the diaphragm, with the downward inclination of the ribs very marked and with the resulting lessening of the normal antero-posterior diameter of the upper abdomen. The viscera of the upper abdomen are all forced to lower levels.

Fig. 5. Extreme ptosis of the diaphragm with resulting extreme ptosis of the abdominal viscera, the stomach of the tubular type hanging well down into the pelvis, the liver with its main axis vertical instead of horizontal. Naturally, under such conditions, all of the other viscera must be displaced downward and such general displacement cannot occur except as the diaphragm and ribs are sagged.

of at least 90°. The twist of the pedicle which such position represents must interfere with the blood vessels supplying the organ.

The colon at the hepatic and splenic flexures, as well as the transverse portion, should, according to the text books, be placed in this upper portion of the abdomen with the attachments at the flexures well up on the posterior portion of the diaphragm. With the sag of the body, and the consequent lowering of the diaphragm, the colon must be forced downward, as well as the other organs. If the attachments are like the text books, this must result in the lowering of the position of the transverse portion with drag upon and kinks forming at the flexures, and with imperfect drainage resulting.

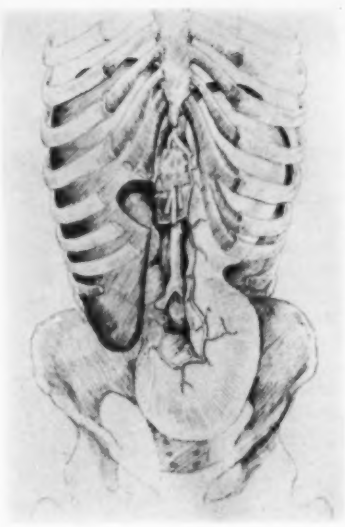


Fig. 6. A Sketch made from study of anatomic subjects as well as from x-ray material showing the marked lowering of the ribs and diaphragm, the stomach being forced downward with marked drag upon the duodenum, which is here shown, with a section of the liver cut away to show the angle between the two portions of the duodenum. It also shows the way in which the superior mesenteric artery is dragged across the transverse portion of the duodenum. The axis of the liver as is shown in Fig. 5, is vertical instead of the normal horizontal. In such a case the stretching of the blood vessels must interfere at times with the arterial flow, or the venous flow.

If, as is the case many times, there is a free mesentery upon the ascending, as well as the descending portions, the drooped position results in the entire colon being forced downward and lying crumpled up in the lower abdomen. When these easily demonstrated conditions are considered, the irregular action of the bowels should certainly not cause surprise.

In the small intestine, similar faulty mechanical conditions exist and since it is from this organ that the chief assimilation of the food values occurs, it should be apparent that not all that concerns malnutrition has to do with the type of food taken.

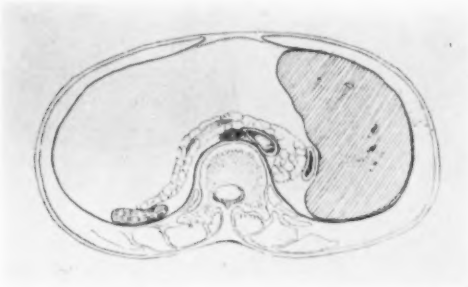


Fig. 7. A sketch of a transverse section showing the way in which the pancreas must be forced backward, as well as downward, when the kidneys are pushed out of place as they are in the general visceroptosis, with the easily recognizable so-called "floating kidney." The drag upon the middle of the pancreas and the blood vessels at that point must be obvious.

Of the blood vessels, the celiac axis is one of the most important and, with the low diaphragm, the arch of the fibres which extend over the aorta must sag and rest upon this vessel. Since the blood supply from this goes to the liver, stomach, duodenum, and spleen, with such easily understood interference with this vessel, it should not be difficult to understand some of the disturbances of function of these organs. The veins which accompany these arteries should be even more markedly disturbed so that at times the symptoms may represent passive congestion of the organ while at other times arterial disturbances. The blood vessels supplying the kidneys must be interfered with at times in the easily demonstrated faulty position, this being enough to explain some of the symptoms, while the possible kinks of the ureters, are easy to understand. Fig. 8.

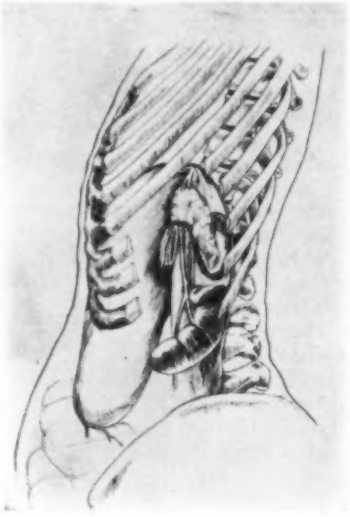


Fig. 8. A sketch made from anatomic and x-ray study showing the marked sag of the ribs, with the downward displacement and rotation of the liver so that the axis is vertical instead of horizontal, with the marked sag and necessary stretch of the blood vessels of the kidney and adrenal body. The lateral spinal space is no longer filled with the kidney, with the resulting backward and downward sag of the end of the pancreas. Note the position of the celiac axis, with the diaphragm hanging upon it.

Both the superior and inferior mesenteric arteries, arising as they do from the anterior part of the aorta, must be put under abnormal tension, with sagging of the organs and crowding or pressing of other organs which are forced downward. Not only must there be difficulty in getting the blood into the part, but getting it away must be much more difficult. Fig. 8. When one considers the stretched condition of the vessels that must exist in such cases, imperfect function should be expected. Beside this, the fact that the venous flow of the blood, which is dependent upon the action of the diaphragm, must be interfered with, as part of the easily demonstrated imperfect diaphragmatic action and circulatory disturbances, should not cause surprise.

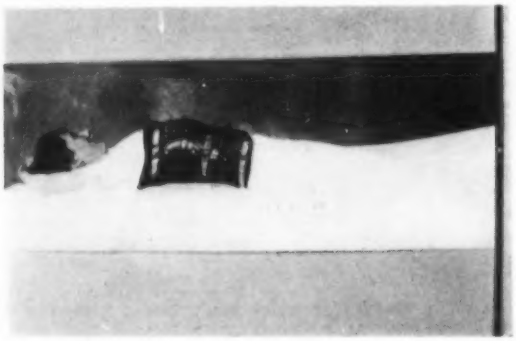


Fig. 9. Leather jacket fitted for bed use. Note the way the jacket is shaped at the dorso-lumbar region, thus holding the ribs forward and insuring adequate space for the viscera in the upper abdomen.

Since it is under such conditions of general visceral sag that varicose veins in the legs are so commonly seen, it is not unreasonable to believe that similar varicosities of the abdominal veins may occur, and some of the ulcers of the stomach, or duodenum, or intestine may be explained in this way. Certainly such a theory is on the whole more reasonable than the vague theories often advanced as etiologic factors in these conditions.

Another effect having to do with the blood vessels that must be a factor in the disturbances, at times, has to do with the superior mesenteric artery which leaves the aorta just above the third portion of the duodenum. One has only to look at the anatomic charts to see how easy the downward drag of this vessel could cause constriction of the duodenum, with imperfect function.

Beside the organs or structures that have been mentioned, the nerve mechanism controlling them is probably of the greatest importance. Surrounding the various blood vessels and ducts, as well as imbedded in the ligaments and mesenteries of the various organs are plexuses of ganglia, and the same mechanical features which control the drainage or function of the organs must at times affect the nerve cells.

In the time that is available, it is not possible to analyze the symptoms which may result with the special part when such mechanical maladjustment has occurred, but once the condition appreciated, the results should not be difficult to comprehend. So, also, with treatment, the time permits only of suggestive lines, the details to be worked out by the physician as the special features are studied. Surgery for the replacement of the organs has been tried but the procedure is not only illogical but the results have been disappointing. The remodeling of the body with the elevation of the ribs and diaphragm so that adequate space exists for each organ, and the proper development of the supporting structures, give the best results.

Fig. 10. Patient fitted with a short back brace under a special corset which holds the body balanced so that the ribs have the proper inclination, with resulting adequate space in the upper abdomen for the viscera. Note the excellent poise of the whole body.

For this, special exercises and positions are used, at first with the body horizontal, the chief aim being to raise the ribs and thus raise hte diaphragm, as well as to spread the ribs sideways, with the resulting broadening of the usual narrow costosternal angle. Space must be made, in these ways, for the organs before there should be hope of improving their position, and once this has been accomplished, unless adhesions are shown to exist, the improvement in the position of the organs, as well as the improvement in their function, should be rapid. If adhesions are present, similar procedures are to be used, but a much longer time will be required to develop the desired improvement.

In connection with the remodeling of the body,

jackets are often of help, these being applied with the body hyperextended at the dorso-lumbar level, Fig. 9. Such jackets should be worn when the body is horizontal and should be removable, so that special exercises, fomentations, and such other physical therapeutic measures, as will assist in improving the shape of the body, as well as stimulating the function of the organs, can be used. Jackets are not as a rule very satisfactory when the patient is allowed up since they do not adequately support the pelvis, but a short back brace and special corset carefully fitted, as shown in Fig. 10, meets the requirements fairly satisfactorily.

Such supports, with the exercises and positions, should be continued until the position of the parts is satisfactory. Once this has been accomplished, the condition should be better, irrespective of the special organ that may have been affected, and unless there is serious damage of an organ, or organs, ultimate good health should be expected. In case actual damage of any of the structures has occurred, the correction of the basic visceral mechanics, many times makes reasonable compensation possible, with actual slight limitation. To correct the obvious faulty mechanical condition first should be our aim as a matter of common sense, with, at the same time, the use of such medical measures as will assist in the function of the special part.

Treatment of Tuberculosis of the Bones and Joints

Clarence L. Hyde, M. D.

As a phthisiotherapist interested and engaged in the management and care of tuberculosis in all of its manifestations, I desire to stress the constitutional nature of tuberculous disease in whatever organ or tissue it is exhibited.

Tuberculous lesions of the bones and joints are usually the result of metastasis from primary foci in the lungs or lymph nodes, and these matastases are frequently multiple, involving various organs and tissues. Accompanying lesions of bones and joints, there are often a greater number of active foci in other tissues, which indicates that such cases are not primarily surgical in character. An average of 2.6 tuberculous lesions per patient were found in our group. Twenty-seven per cent of the children and forty-eight per cent of the adults had from three to fourteen different lesions widely scattered throughout the body. Over one-half of the patients fifteen years or older had pulmonary tuberculosis as well as the bone and joint lesion. The ratio of orthopedic lesions to other types was one to one.

General Plan of Treatment

Proper medical care is the first requirement for all cases of bone and joint tuberculosis, but for many cases medical care alone is inadequate to obtain the best functional result. The phthisiotherapist is needed to guide the treatment of the tuberculous aspects of the disease, while the surgeon supervises the orthopedic problem per se.

The failures of treatment are not so often due to the condition of the joint, but to inopportune and unwise medical or surgical treatment. The average duration of the disease in our patients, including all types of bone and joint lesions, was about six years. More than one-half of this time represents the penalty of delayed diagnosis, inadequate treatment, and either delayed or unwise surgical intervention.

The period of treatment could have been shortened and better functional results obtained in many instances, had physicians and surgeons in general practice consulted more often with specialists proficient in the diagnosis and treatment of the disease. No other form of tuberculosis requires more active and intelligent cooperation. A combined medical and surgical opinion is needed for diagnosis and for the formulation of a plan of treatment, whether it be operative or conservative.

Resume of Discussion at Conference of the International Union Against Tuberculosis. Warsaw, Poland. September 4-6, 1934.
The Edwin Shaw Sanatorium, Akron, Ohio.

Medical Measures

The essential elements of medical treatment are constitutional and orthopedic rest, adequate diet, and a life in the open air. They have a universal application and are suitable for all types of tuberculous lesions, individuals, and climates. Heliotherapy and actinotherapy are most useful adjuncts but are limited in the scope of the application and must be prescribed selectively for lesion, individual, and climate. Ambulatory methods have no place in the treatment of active joint tuberculosis, for, even in the absence of other demonstrable lesions, we are dealing with a potentially generalized tuberculosis.

The rest prescribed is both constitutional and orthopedic. The body is placed in a recumbent position upon rigid beds. Orthopedic appliances are selected which will immobilize the joint, maintain the desired position, and yet not interfere with light treatment. Pillows and extension apparatus allow too much freedom of motion for some cases of active tuberculosis. When the disease is acute, and a good position difficult to maintain, it may be necessary to use plaster casts or plaster shells until activity has subsided. The type of apparatus most suitable for the individual case depends upon the state and extent of the lesion, and whether it is acute or chronic. The plaster shell has been very useful in the prevention of deformities and the maintenance of a good functional position.

Rigid immobilization is maintained until activity has subsided and the danger of deformity has passed. As soon as it is safe to remove the plaster shell the patient is fastened to a Bradford frame or rigid bed. More freedom is then allowed, but recumbency is maintained for several months or until the disease becomes quiescent. When x-ray and physical examination indicate that the disease has become quiescent, and the physician and surgeon agree that it is safe to allow ambulatory treatment, the patient is placed in suitable splints or braces and gradually allowed out of bed. Certain cases of indolent spine, hip, or knee tuberculosis without abscess or sinus formation, which have been afebrile for several months are allowed to be up, but the lesion must be protected and kept immobilized by apparatus. Weight bearing is deferred until the patient has been ambulant for several months and the increased exercise indicates that it is advisable. With weight-bearing joints, the disease should be clinically healed and the joint stabilized when this point is reached.

When it is possible, an effort is made to correct contractures. They are reduced gradually; forcible cor-

rection is never attempted. In acute processes, with destructive disease of the joint, it may be advisable to allow the joint to assume its own position and to correct the distortion surgically after the disease has become healed.

There is a considerable difference of opinion with regard to the effect of a faulty diet upon the development of tuberculosis. The effect of disturbed social conditions and lack of food upon the tuberculosis death rates during the World War give evidence that food is a most important element in the prevention of the development of the disease and it is the clinical experience of phthisiotherapists that an adequate diet is essential for the treatment of tuberculosis. Children particularly need an adequate and well-balanced ration to insure normal healthy growth. Fully developed cases of rickets and scurvy are not often seen with tuberculosis, but children frequently are in what McCollum calls the "twilight zone" of nutritional instability. Most of them show malnutrition at the time of diagnosis, and, undoubtedly, it has much to do with the development of the disease.

Many of the patients are underweight; but they may be normal or even overweight; they have diseased tonsils, otitis media, sinus disease, and faulty food and health habits. In order to correct their habits and get them to eat an adequate amount of suitable food, these physical defects must be corrected. Chronic infections of the ear, nose, and throat often are the cause of poor appetite and an aversion to food.

All factors essential for growth are supplied when patients are treated with heliotherapy and given a liberal amount of raw fruit, leafy vegetables, and whole milk. The deficiency of sunlight during the winter months may require the substitution of ergosterol or cod liver oil.

The tuberculins and other products of tubercle bacillus are not used for treatment to any extent in the United States. Gold and copper salts have doubtful value. They have some advocates in Europe and South America but have not been well received in this country. Insulin is sometimes given to boost the appetite; it has no effect upon the disease.

The calcium compounds have achieved wide popularity, but the basis for their use is open to question. Compounds of calcium or phosphorous given with ergosterol or cod liver oil do not seem to have any intrinsic effect upon the tuberculous process or influence the deposition of calcium. Decalcification takes place when the joint is immobilized and it recalcifies as soon as more freedom of motion is allowed. Sanatorium patients who are treated with complete rest and immobilization rarely show deposits of calcium in healed tuberculous nodes or abscess. On the other hand, clinic patients who are on exercise frequently heal with deposits of calcium in the tubercles or even completely calcified abscesses.

Sun and light baths have caught the fancy of the public. There is much benefit to be derived from them. But the laity and many physicians misinterpret their value as a therapeutic measure for the treatment of tuberculosis. When used alone without rest and immobilization they may stir up and spread the disease. Their value comes only when used with rest, immobilization, good food, and a life in the open air.

The open-air bath seems to be a necessary constituent of the light bath. The solar baths under ultraviolet transmission glass do not have the same effect as natural heliotherapy, which has proved to be the best form of light treatment for bone and joint tuberculosis.

The conditions under which solar baths are taken are never the same. Each day provides a different combination of light, temperature, humidity, and air currents. The constantly changing weather conditions and the out-door environment give the bath interest and make it pleasant and colorful to take. Some physicians have attributed the beneficial results of heliotherapy to the stimulus of the out of door life more than to the action of the sunlight alone.

Artificial light baths indoors do not have the same value as heliotherapy. The conditions of the bath remain more or less monotonous. The light, ventilation, temperature, and humidity do not change, and the bath becomes uninteresting and wearisome.

Most patients are not blessed with a residence in a climate which allows heliotherapy to be taken throughout the year, nor can they change their residence from plain to mountain or to seashore as proposed by Prof. Putti of Italy. Such a plan is feasible in Italy and other European countries whose topographical features vary widely within a small radius, and where public institutions and agencies are under the control of a central organization, but it is not practical in the United States for both geographic and political reasons. There the distinct climatic and topographical environments exist only at great distances. They are but rarely found within the limits of a single state or political unit. Therefore, patients are confined to the same climate from the beginning to the end of their treatment. On dark days or during the winter months treatment must be given with arificial light and air baths indoors. For the treatment of bone and joint tuberculosis when sunlight is unavailable we prefer the carbon arc as the source of artificial light. It is combined with a system of forced ventilation, temperature, and humidity control. We have found it the best source of light to tide the patient over the winter months until natural heliotherapy can be given in the spring.

SURGICAL MEASURES

The tuberculosis surgeon must avoid two prime fallacies: (1) the conception that bone and joint tuberculosis is a local disease, and (2) the assumption that operative intervention and operative recovery are the chief end of treatment.

The function of operative surgery is not curative. It is used to correct fixed deformities which have developed in the course of the disease, or to ankylose flail and unstable joints, thus lessening the likelihood of recurrence.

The need, time, and choice of operation are determined by the physician and surgeon after a long period of observation. If an operation is decided upon, the aim is to establish bony fusion of the joint in the correct position. Operative procedures should be extra-articular to avoid disturbance of the pathological process. Unless bony fusion is obtained, the operation has been a complete failure and the joint should be operated upon again.

We have used Hibb's method of operation to stabilize the spine, hip, and knee with excellent results. Hibb's technique is modified by the employment of an osteoperiosteal graft for lesions of the dorsal and lumbar spine. The operation of choice for the shoulder is extra-articular arthrodesis by osteoperiosteal graft; for the wrist and ankle, arthrodesis with partial excision.

Surgical treatment, well timed and well performed, gives complete immobilization and permanent rest to the diseased joint. It renders joints better able to withstand the trauma of normal life and diminishes the chance for local recurrence of the disease. The dangers of surgical intervention are: (1) the molestation of areas of active disease, and (2) interference with bone growth.

TREATMENT OF CHILDREN

Non-operative methods have given excellent results with the majority of our children under ten years of age. Good fusion and ankylosis with a minimum of deformity

has been obtained in tuberculosis of the spine, and has withstood the strain of normal activity many years without recurrence. Good motion commonly returns to the smaller joints, such as the digits, hand, wrist, foot, ankle, elbow, jaw, and sometimes the knee.

In these joints full function may oftimes return. Adequate motion returns to a tuberculous hip only when the diagnosis is made at the incipiency of the disease and treatment is immediately instituted. When such a result is obtained, the diagnosis may justifiably be doubted unless it is supported by incontrovertible bacteriological and pathological evidence.

A satisfactory fusion of the hip has been obtained in some cases by medical treatment. Where fusion of any of the larger joints is unsatisfactory and the joint appears to be flail and unstable, arthrodesis should be performed, but when possible, it should be deferred until the second decade of life. No attempt is made to correct fixed deformities by manipulation or extension apparatus. They are corrected by osteotomy after the disease has become quiescent and the bone fully developed.

Recovery, with limited motion of the hip or knee, may or may not be safe. It is sometimes the result of inefficient treatment and the joint offers insecure support. Such patients may maintain their health for a number of years, but they must be considered unsafe from recurrence of the disease in the joint, even metastasis, if trauma should occur. I am convinced that fixed joints give the greater security.

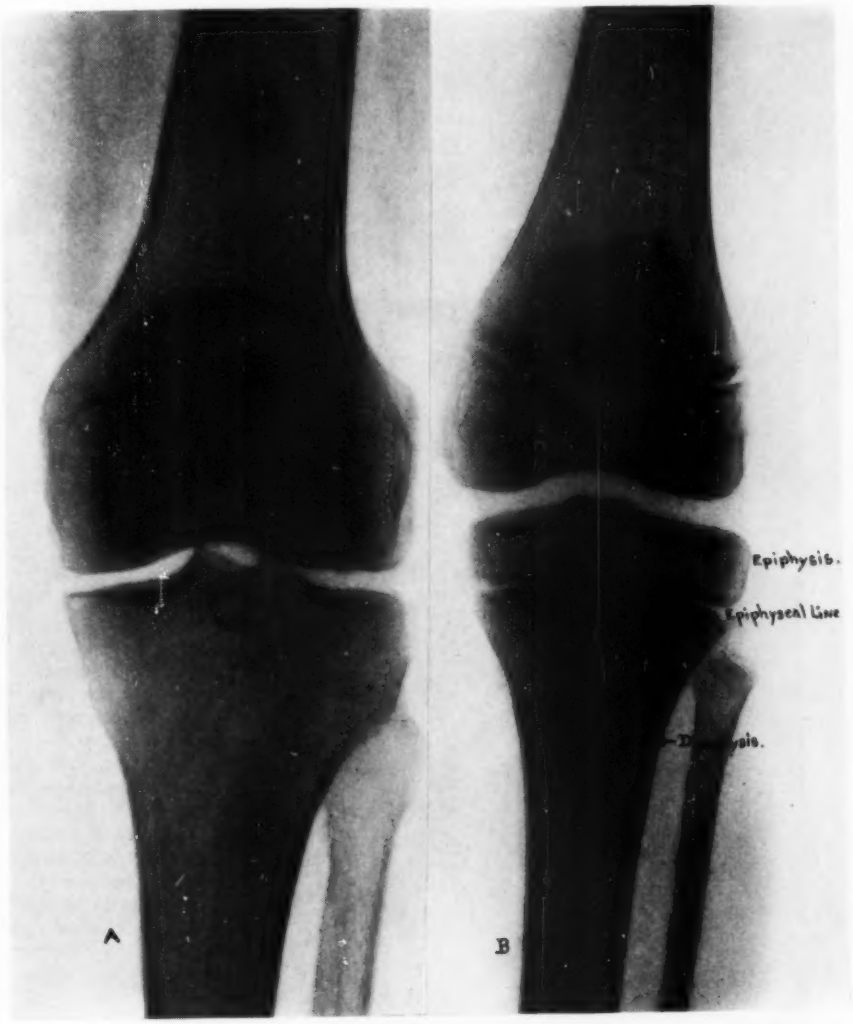
Endocrinology and Physical Therapy

Clifford A. Wright, M. D.

II. Overgrowth

Dwarfism due to several different causes was discussed in a previous paper.[1] The next condition to which your attention may be called is overgrowth. As in dwarfism, excessive growth may be caused by several factors, some of these glandular, involving the pituitary body, sex glands and suprarenal cortex.

In disturbances of some of the ductless glands, symptoms of overactivity may be the opposite of those associated with underactivity, as for example, the fast heart, loss of weight, flushed warm and moist skin, hyperactivity mentally and physically, and increased basal metabolism seen in hyperthyroidism as contrasted to slow pulse, frequent increase in weight, dry lifeless skin, sluggishness mentally and physically, and low basal metabolism associated with hypothyroidism. This is not always true in relationship to growth, however, for while we see dwarfism in hypo-pituitarism involving the growth hormone and overgrowth in overactivity of this principle, this relationship is not true in con-



Illus. 1. A shows epiphyseal union, while in B the union has not taken place and further growth may occur.

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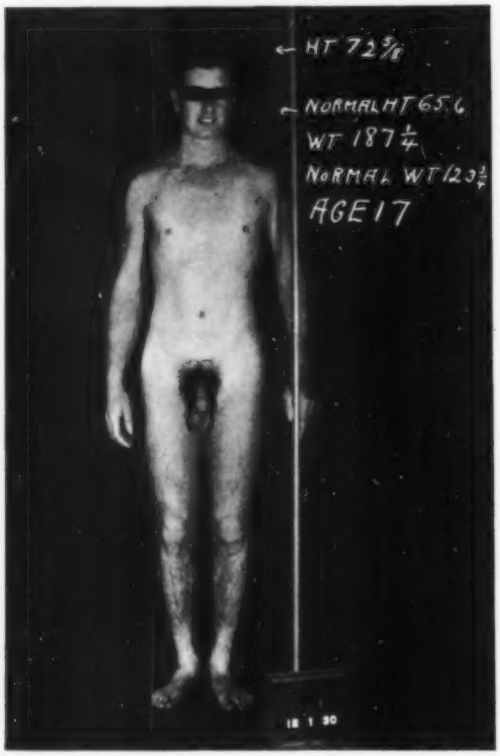
This is the second article by Dr. Wright upon the subject of Endocrinology. The first appeared in the July-August, 1934, issue. The third will appear in a later issue.

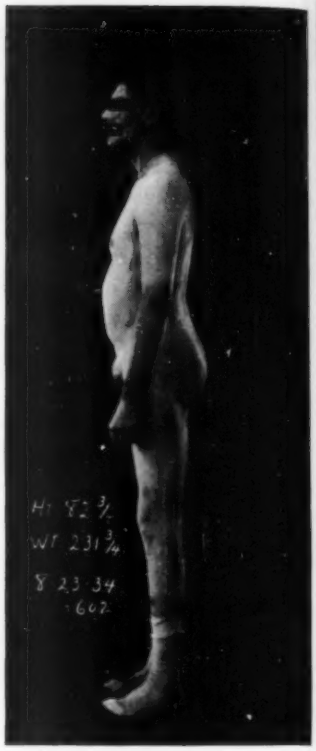
nection with the thyroid and we do not see overgrowth from overactivity of this gland.

In discussing dwarfism the nutritional and rachitic types were mentioned as probably due to lack of food factors and vitamins. Growth is enhanced by the use of vitamins but an excess of these food factors will not produce overgrowth. All long bones during their development are composed of a shaft or diaphysis and distal ends or epiphyses. (Illus. 1.) The lines joining the diaphyses and epiphyses are known as epiphyseal lines. Most of the bone growth goes on at the epiphyseal lines and as long as they remain open, growth may occur and when they are closed, growth is practically finished. While it varies somewhat in different long bones, epiphyseal union occurs at approximately eighteen to twenty years of age. (Some authors give it as eighteen in girls and twenty-one in boys). The time of epiphyseal union is influenced by some of the ductless glands. This will be discussed later. An excellent treatise on this subject was written by Engelbach and McMahon.[2]

As stated previously,[1] other conditions being the same, the growth of an individual is a definite indication of the activity of the growth hormone of the anterior lobe of the pituitary gland. This hormone is active throughout life, promoting growth as long as possible or up to the time of epiphyseal union when growth is known to be finished. After that time this hormone is active in controlling body metabolism and particularly in maintaining muscle tone. It is undoubtedly one of the factors maintaining the normal development and activity of muscle, and insufficiency of this active principle is the cause in some cases of poor muscle tone and possibly some types of paralyses. As is the case with underactivity or deficiency of this hormone, overactivity or an excess at any time in life usually gives rise to definite symptoms. In overactivity before epiphyseal closure, excessive growth results. This occurs even in infancy and can be diagnosed very early in many cases. Where the overactivity occurs after epiphyseal union when no further growth is possible, we have an interesting condition known as acromegaly which will be discussed later.



Illus. 2. Shows rapid growth in a boy of 17 yr.; normal sexual development.



Illus. 3. Non-pathological giant 82⅜ inches. Weight 231¾ lb. Body proportions normal; legs bandaged for varicose ulcers.

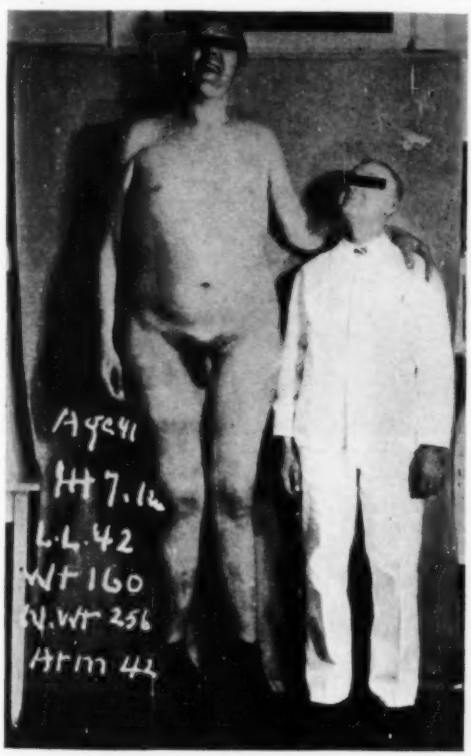
In overgrowth we must distinguish between a tall normal individual and one who has true giantism. An arbitrary figure of eight-one inches has been accepted by one authority (Bollinger) above which any height should be called giantism. This is undoubtedly too high. Engelbach[3] in a section on Anthropometry gave tables of normal height in which the maximum normal for man was given as 70.2 inches and 66.1 inches for women. While growth usually occurs at a rather regular rate, it may vary in different individuals and at different times, some persons making excessive growth for a short time and later less than the average normal, so that ultimately they are of normal stature. The statement is frequently made, "I was as tall at sixteen as today," or "I didn't grow much until seventeen years, then made up for lost time." Such characteristics are many time familial. I have frequently seen patients of sixteen who had finished their growth. The epiphyseal lines were closed and subsequent observation showed that they had finished growing. In some tall patients who have made definite overgrowth, in spite of the fact that the long bones are excessive in length and this would seem to indicate an excellent calcium metabolism, there are deformities such as scoliosis and pigeon breast, which would indicate lack of proper lime balance, rather an inconsistency. It is possible that the shorter bones are robbed of their lime so that the excessive growth of the long bones may be supplied.

The sex glands influence growth in an entirely different manner, namely through their relationship to the closure of the epiphyses on which union they exert in some manner a marked influence. In underactivity of the sex glands or hypogonadism there is delayed or late epiphyseal union while early closure is seen in the virile type of man or woman. In the former condition when the epiphyses remain open longer allowing more time in which the bones may grow, and in the more marked type called eunuchoidism, which is due to a marked underactivity or absence of the sex glands, definite changes in body development may occur. Even before the normal time for epiphyseal closure in the eunuchoid types, we see excessive growth as though a normal antagonism exerted by the sex glands on the hypophysis had failed.

This apparent antagonism beginning sometimes rather early in life has not received rational explanation. It is believed by many workers that there is an antagonistic action existing between the basophilic cells (which give off the sex principle) and the eosinophilic cells (which produce the growth hormone) of the anterior lobe. It is also a known fact that the basophilic cells control the development of the sex glands. Thus, theoretically, the opinion could easily be formed that in these tall individuals the basophilic element of the anterior lobe is not normally active, causing hypogonadism and allowing an unusual activity of the growth hormone. With this foundation it is now possible to discuss some of the different types of overgrowth.

First, there is the rapid growth not sufficient to be called giantism and falling perhaps within normal limits, due to moderate overactivity of the growth principle. These individuals may have normal sexual development and normal body proportions. Many times they make much of their growth before sixteen, or even fifteen years of age and x-rays may show early epiphyseal union. They usually enjoy good health, Illus. 2.

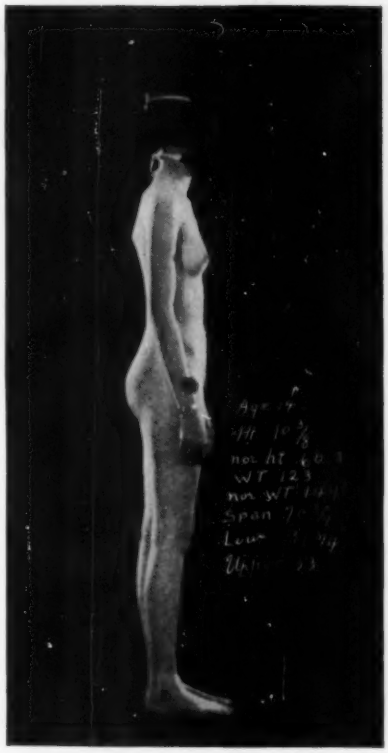
Second, there is the non-pathological giant or giantism which is not due to tumor of the pituitary gland but undoubtedly caused by functional overactivity. This condition is characterized by excessive growth with either normal body proportions or somewhat longer lower length. These patients do not show the usual evidence of pituitary adenoma and are to be distinguished from the so-called eunuchoid giants, Illus. 3. They are usually not as strong as would be indicated by their size. Varicosities of veins of the lower legs are found more frequently in this type and in acromegaly than in normal individuals. Physical therapy may be of considerable advantage to these patients particularly as a stimulant to peripheral circulation.



Illus. 4. Pituitary giant; X-rays show tumor of the pituitary gland. Note comparison with normal man.

Third, there is the pituitary giantism due to adenoma of the pituitary gland, Illus. 4. This patient has a pituitary adenoma (undoubtedly eosinophilic adenoma) which has given off an excess of the growth principle causing rapid and excessive growth. With this he had genital aplasia, possibly caused by pressure of the adenoma on the basophilic cells, or an antagonism between the growth and sex principles. He grew until he was twenty-five years of age. His father and paternal uncle were pituitary giants.

Fourth, as stated above, the so-called eunuchoid giant, Illus. 5 and 6, is due to insufficiency of the sex glands allowing late closure of the epiphyses and excessive growth. In this type the body proportions are abnormal with a long lower length as compared to the upper length, with long arms and legs, and long narrow hands and feet. Postural defects are quite common. These patients all show the classical syndrome of hypogonadism or eunuchoidism, characterized by poor muscle tone, sluggish circulation with cold, bluish hands and feet, also sexual inactivity in



Illus. 5. Shows girl 14 yr; height 70⅜ inches; would be classified as giantess.

Illus. 6. Typical eunuchoid giant; height 73 inches; note eunuchoid body proportions and sexual aplasia.

men and irregular scanty menstruation, or amenorrhea with frigidity, and frequently sterility, in women. Physical therapy as an adjunct to endocrine treatment is of special benefit to these people. It should be remembered that they are not capable of strenuous work. Stimulating type of physical therapy should be used.

Fifth, there is the rapid growth caused by hypogonadism, Illus. 7, not excessive enough to be called giantism. This type is due to unopposed excessive activity of the growth principle due to ovarian insufficiency.

Illus. 7. Rapid growth due to hypo-ovarianism; height 67⅞ inches; eunuchoid body proportions, lower length 36½ inches; upper length 31⅜ inches. Age 18 years.

The suprarenal glands, particularly the cortex, have a marked influence on body development, and in overactivity or with adenoma we see a marked influence on growth. The symptomatology of this condition depends on when the abnormality begins. When it starts in childhood we find a condition known as macrogenitosomia, which means enlargement of the genitals and body. This condition is more frequently found in boys than girls and is characterized by a rapid early growth as well as precocious sexual development and while the growth at first is rapid, due to overdevelopment of the sex glands there is an early epiphyseal closure and ultimately the individual is shorter than normal, Illus. 8. These patients show excessive strength for their ages. They are frequently guilty of sex irregularities.

Remarks: Not a few children, both boys and girls, are taken to a doctor's office for an investigation into the cause of too rapid growth. In forming an opinion of a growth problem, all factors must be taken into consideration, among these family characteristics. Two patients, brother and sister, seventy-one and one-half inches and sixty-three and one-eighth inches, respectively, had unusually tall parents. It is surprising that a very few parents actually know how much the child has grown during the last year and usually no exact record has been kept. Just recently a girl was brought to my office by her mother who said that they knew she had grown because of the way she looked standing beside her father. In this condition as well as many other endocrine disturbances, it is first necessary to make a diagnosis as to which gland, or glands, are involved and treat the patient accordingly. It is my policy when the patient, a boy or girl, who is showing excessive growth, is brought to the office, to make x-rays of the knees to learn whether or not there is epiphyseal union. Occasionally it occurs as early as fifteen or sixteen. If there is closure, nothing is to be gained by treatment. If epiphyseal union has not occurred, treatment may give results. In the hypogonadal type showing continued and excessive growth particularly in girls, it is logical to give them some of the more potent ovarian products intensively over several months' time; these girls usually show menstrual irregularities consistent with their body findings, which frequently respond to this treatment. With this, rather large doses of lime by mouth should be given. Quite frequently the results are surprising. In the hypogonadal cases which do not respond to treatment of this type and in excessive growth from overactivity of the growth hormone, x-ray therapy may be used. It should, in my opinion, be used only after other methods of treatment have failed or in extreme cases, for in knocking out the growth principle the rest of the gland will suffer as well and we may have a marked interference with the sexual and reproductive functions and obesity of the pituitary type; later these patients require substitutive therapy. In that type of giantism due to tumor of the pituitary gland, x-ray therapy is indicated, and in a very few patients surgical procedure.

Illus. 8. Height 38½ inches; normal 32½ inches. Note advanced development physically and sexually; X-rays show advanced bone development. Diagnosis—Macrogenitosomia.

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Physical Therapy in Muscular Dystrophy

C. F. Davidson, M. D.

Observation through years of the progression of muscular dystrophy beginning, in a child apparently in normal health, with muscular weakness, developing through decreasing ability to get up and about to a rigid body distorted and deformed by contractures, makes one long for more power to curb the disturbance or at least help those who must endure such an affliction. The disease, though relatively infrequent, is wide spread in its distribution and devastating in its effects. The cause is not known. Drug therapy is of little avail. Physiotherapy offers a service that can always be used to delay and minimize the disability and distress incident to contractures and in some cases help to recover muscles toward normal function.

The pathological process back of the clinical picture of muscular dystrophy presents itself early as a so-called Zenkers degeneration in scattered muscle fibres. You may remember the diagrammatic picture of a voluntary muscle fibre. A muscle fibre might be described as a bag of protoplasm four to six times as long as wide, with cross striations. In Zenkers degeneration these cross striations disappear and the protoplasm within the limiting membrane appears under the microscope as a homogeneous mass. Such a fibre has lost its power to contract. The decrease in strength in a given muscle or group of muscles will vary directly with the number of cells exhibiting the pathological process. Such a pathological picture is often found in association with muscle weakness encountered after acute infections.

A later picture in muscular dystrophy reveals the deposition of fat globules between the muscle fibres and even within the fibres. This deposit of fat accounts for the apparent enlargement and firmness of certain muscles —especially the calf muscles. This enlargement, sometimes occurring in muscles other than those of the calf, is responsible for the term pseudohypertrophic muscular dystrophy.

In contrast to the firmness of muscles exhibiting such deposition of fat, the muscle tone of the dystrophic child is almost nil and the muscles feel flabby. The lack of tone and muscle strength is strikingly exhibited by the weakness of the muscles of the shoulder girdle. This weakness of the muscles allows the shoulder girdle to slip up when the hands are placed in the axillae and an attempt made to lift the child. It feels as if the shoulder girdle would be stripped off from its attachments.

The next step in the progress of the disease consists in the multiplication of the number of nuclei in the involved muscle fibres, and the infiltration of small round cells and subsequently the development of an excess of fibrous tissue. The fibrous tissue thus developed is devoid of the elasticity characteristic of muscle tissue. The tightening up of this elastic tissue just as in scar tissue elsewhere results in contractures. Such contractures are responsible for the late distortions and deformities and rigidity exhibited in the advanced patient.

Physical therapy has much to offer the patient beginning to develop muscular dystrophy. The treatment indicated is much the same as that for the early poliomyelitis. Fatigue must be avoided. Just as in poliomyelitis the stronger muscles must not be allowed to contract and keep the weaker opposing muscles stretched. Allowing the stronger muscles to remain contracted and the weaker stretched reacts detrimentally to both sets of muscles. The weaker are unduly fatigued and possibly made more vulnerable to deterioration. The stronger muscles through prolonged shortening are allowed to develop contractures especially noticeable and disturbing in the arms and legs. The arms tend to become flexed at the elbows, the legs flexed on the hips and at the knees, and complete extension becomes impossible. Toe drop is prone to develop. Contractures and deformities, through the use of physical therapy, are much more easily prevented than corrected.

Early persistent care in seeing that the arms and legs get hours in complete extension equal to the hours spent in flexion and early recognition and attention paid to spinal curvatures, will go far toward preventing contractures and deformities.

Contractures and deformities once developed offer real problems that can be solved only through physical therapy. Contractures in the calf muscles is the one exception to this statement. Tenotomy, elsewhere than in the Tendon of Achilles is not practical, and only stretching and manipulation remain as means of treatment.

The tank offers the most advantageous opportunities for the care of such cases early as well as late in the disease. Owing to the fact that the upright position is maintained only with well balanced muscular action, dystrophic patients find difficulty in being much on their feet and quickly become unduly fatigued. Remaining stretched out in a reclining position soon becomes monotonous. Consequently, much sitting is indulged in. Sitting requires flexion at knees and hips and favors gradual development of inability to completely extend the legs. The disadvantage of prolonged flexion is more easily combatted in the water. With the buoyant power of the water caring for part of the body weight, the patients can wade and swim and exercise in the tank much more adequately than out of water.

Exercise is just as important as maintenance of position. The muscles in these victims are just as prone, if not more prone, to deterioration from lack of use as are the muscles of normal children. Muscles in normal children become flabby and weak if they are not used. The muscles of the dystrophic child must be exercised daily in attempts to maintain the best nutritional condition possible. Here again the tank offers a great advantage because the bouyant power of the water helps to overcome the pull of gravity; freed from the necessity of lifting their own weight, muscles may be exercised in a tank for a longer time before fatigue demands cessation.

Muscular dystrophy cases should not be deserted to progress to a hopeless invalidism just because they have been considered hopeless in the past. Remembering the

Polyclinic, American Bank Bldg., Seattle.

occasional case that recovers and hoping for advances that will open up new lines of treatment, we should spare no effort to keep these patients in the best condition possible. When diabetes in childhood was considered invariably fatal, many a child was kept alive by the strictest sort of regime to enjoy the advantage of insulin therapy. Carrying on in the face of almost certain defeat saved many children who now, thanks to insulin, are enjoying a very comfortable existence. Today the use of glycine in cases of muscular dystrophy seems to offer some advantage. The advantage this material might offer came through information gained from the laboratory. From the laboratory we may justly expect further help. But whatever the advances that may come, whatever the medical treatment that may be developed, it seems altogether unlikely that we shall ever escape entirely from conditions that can be most efficiently cared for only through the use of the principles underlying the practices involved in physical therapy.

The regime in the care of these cases must not be relaxed nor stopped even for a few days. Muscular dystrophy is a chronic condition and the factors tending towards increased difficulties never abate. It is not always easy to get these ideas over to parents. The physical therapeutist is fitted by training and experience to help educate parents and guardians to these facts. Convictions engendered by months and even years of work on orthopedic problems and the enthusiasm developed from the satisfactory results so often attained, train the physical therapeutist as an able advocate for persistent, consistent, continued treatment. In the face of the hopeless outlook offered by the history of progression in these cases, and the continued expense incident to adequate care and the burden of never relaxing the care, parents and guardians too often relax or stop treatment. Inexhaustible enthusiasm, patience and sympathy are necessary to maintain continued treatment. No group of workers other than physical therapeutists is more adequately equipped by training or by their work to help maintain the morale required to carry on in cases generally considered so hopeless.

Electropyrexia with the Inductotherm

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J. G. Marshall, A. B., B. P. E.

A convenient, effective, simple, and sanitary method has been devised for the production of electropyrexia by means of the Inductotherm. This method has been found to be particularly applicable to the treatment of private patients, where the comfort of the individual throughout the duration of the treatment is of paramount importance.

Since with the Inductotherm heating of tissue is produced by electromagnetic induction and hence with it the more conductive tissues are heated more rapidly than the less conductive tissues[1, 2] it is logical when administering a fever treatment to apply the cable electrode of the Inductotherm to the most vascular region of the patient's body. This ideal positioning can be achieved effectively with a pancake coil, applied as shown in figure 1. Two oblong turns of the insulated flexible cable are adjusted over the trunk of the patient within one to two inches of the body. This distance can be adjusted to accommodate patients of various size by the supporting device attached to the top of the treatment cabinet.

The rate of increase in general body temperature of a patient depends not only upon the rate of heat input, but also upon the rate at which heat is lost by the patient. Heat loss may be due to one or more of the following: conduction through surrounding materials; radiation from the body of the patient; and evaporation of perspiration.

In order to obtain the greatest heating efficiency possible and at the same time to assure maximum comfort to the patient, appropriate steps were talken to keep heat loss at a minimum. This was achieved by the use of a specially insulated treatment cabinet, constructed of non-magnetic and thermally and electrically non-conductive materials. Cabinets similar to the one employed by us have also been used effectively for the reduction of heat loss by Bishop, Horton and Warren in conjunction with diathermy.[3]

The cabinet is equipped with a special device to raise the temperature of the air within it to approximately body temperature before the patient is positioned for treatment. This pre-heating device consists of two individually controlled infra-red heaters, which are operated in conjunction with a fan for forcing the air within the cabinet into circulation. The fan, however, can be operated independently of the heaters, and provides an efficient means of reducing the temperature of

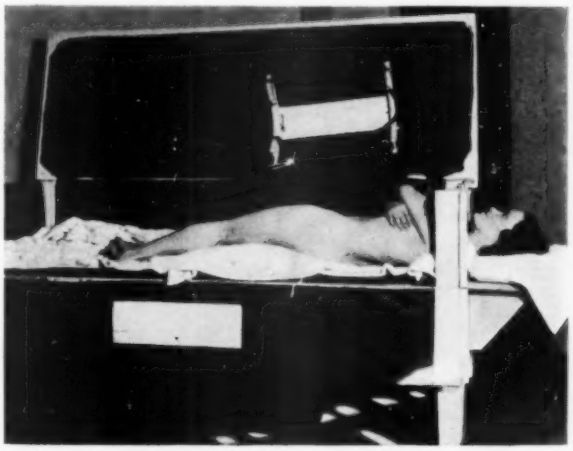

Figure 1. Treatment cabinet showing patient and cable electrode of the Inductotherm in position.

Chicago, Illinois.

the patient when desired. The heating units and fan are installed in the lower compartment of the cabinet. The air is forced up at the foot of the cabinet and is drawn down over the sides of the patient.

A thermostatic control regulates the environmental temperature so that it never exceeds 106.5 degrees Fahrenheit. This ambient temperature is sufficient to compensate for loss of heat by the patient through radiation. By partially humidifying the air within the cabinet before it circulates over the patient's perspiring body, the loss of heat due to evaporation of perspiration is minimized.

We have observed that with the use of the Inductotherm for electropyrexia, the pulse rate is on the average lower than when other means are employed. It is interesting to note that the pulse rate rose on an average less than five beats for each degree rise in temperature as shown in figure 2. This observation is particularly true at low ambient temperatures (approximately body temperature) as compared with excessively heated air of 145 degrees to 155 degrees Fahrenheit.

Experimental work by Benson indicates that the pulse rate is primarily a function of skin temperature and not of internal temperature of the patient.[4] Clinically, Osborne and Markson have observed the debilitating effects of high external temperature.[5] Our observations are in agreement with Benson's experimental work and the clinical observations of Osborne and Markson. The inadvisability of using external heat alone for raising body temperature is obvious. No greater external temperature should be employed than is sufficient to prevent excessive loss of heat from the patient. By the use of the Inductotherm in conjunction with the treatment cabinet discussed in this paper, a type of heating is achieved which, in our opinion, is to be preferred to that obtained with other methods which have been used for raising body temperatures.

The unclothed patient can be placed conveniently in the cabinet by raising the top and lowering the hinged side as illustrated in figure 1. Easy access is obtained during treatment by means of a hinged panel in the side of the cabinet. A sponge rubber mattress for the patient to lie on and sponge rubber lining of the sides, made for increased comfort and safety of the individual as well as for greater heat insulation. Furthermore, this rubber lining permits easy cleaning and sterilization of the interior of the cabinet. When placed in the cabinet, the patient is free from all weight and constrictions on the body and may turn and move about at will.

The inductotherm in conjunction with the treatment cabinet produces a very satisfactory rise in body temperature as shown by the curves in figure 3, which are composite temperature and pulse curves of a series of treatments on the same patient.

Proper preparation and care of the patient is essential to a satisfactory treatment. The patient to whom an electropyrexia treatment is to be given should be prepared with as much consideration as if he were to be subjected to a surgical procedure. Thorough evacuation reduces the possibility of toxic effect to a minimum. Sufficient sedatives to keep the patient drowsy makes for better patient reaction. On arrival for treatment, the patient is given an adult dose of sedative. Several different sedatives have been used with varying success. Among these are: Ortal Sodium, nembutal, phenobarbital (luminal), amytal, pantopon and bromides. Of this group, bromides in the form of penta-bromides have proved to be very satisfactory. When the patient nears the uncomfortable temperature range of approximately 102 degrees Fahrenheit, one-third grain of pantopon is administered hypodermically.

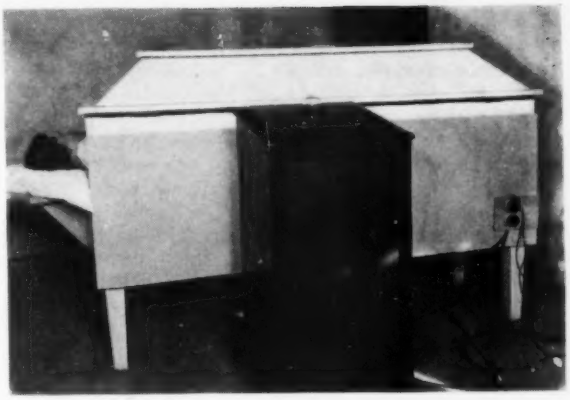

Figure 2. Inductotherm and treatment cabinet. The control panel for pre-heating device is shown conveniently mounted.

Those familiar with electropyrexia readily realize the ease with which a treatment can be given when the use of surface electrodes is eliminated, when there need be no restriction or weight on the patient's body, when access to the patient is easy and when sedatives are given to keep the patient drowsy. We feel that the Inductotherm technic for electropyrexia as described in this paper makes possible the administration of effective fever treatments with maximum comfort and safety to the patient.

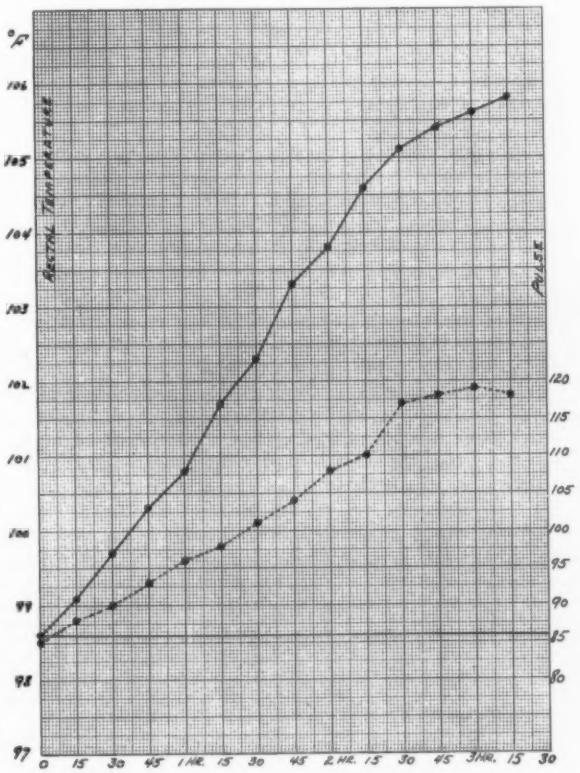

Figure 3. Composite temperature and pulse curves of a series of treatments on same patient.

SUMMARY

(1) A convenient and effective technic for the production of electropyrexia by means of the Inductotherm is described.

(2) The heating characteristics of the Inductotherm are such that heat is produced at the maximal rate in the more vascular tissues, which permits increasing body temperature very efficiently with the pancake coil technic.

(3) A treatment cabinet for reducing heat losses to a minimum, yet making for maximum comfort of the patient, is described.

(4) A simple device for pre-heating the cabinet making for more rapid rise in the patient's temperature and for reduction of the total length of the treatment is described.

(5) The proper preparation and care of the patient, essential to satisfactory treatment, is discussed.

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Pelvic Inclination in Relation to Stability of the Hip Joint

John G. Kuhns, M. D.

The human pelvis has undergone extensive changes in its evolutionary development, not only in its form and the muscular attachments which it provides, but also in its relative position in relation to the long axis of the body. There are differences in size and shape, depending upon the anatomic type of the individual, upon congenital abnormalities in the low lumbar spine and sacrum and upon previous disease. All of these may alter the pelvic contour. The muscular development about the pelvis also plays an important part in its growth and ultimate shape.[1]

The pelvis, supporting the spinal column above and providing attachment for the lower extremities, is one of the most important parts of the locomotor apparatus. It is composed of the two innominate bones posteriorly and laterally, with the sacrum and its attached coccyx separating them posteriorly. There are extensive muscular attachments covering its outer and inner surfaces. It has a relatively fixed position, being placed somewhat obliquely in relation to the trunk so that the superior aperture may form an angle of thirty or more degrees with the horizontal plane. The female pelvis usually has a greater obliquity than the male.

Although the pelvis assumes a relatively fixed inclination in the upright position, provision has been made in its articulations with the torso above and with the lower extremities for adjustment due to changes in the position of the legs and of surfaces in sitting, standing, and walking. A certain amount of lateral tilting of the pelvis is possible through lateral flexion in the low dorsal, and to a less extent in the lumbar vertebrae. Changes in the antero-posterior plane occur chiefly from motion at the lumbo-sacral articulation associated with an increase or a decrease of the lordosis of the lumbar spine. As much as ninety degrees of change in the antero-posterior inclination may be possible in slender individuals after special training, particularly in acrobats and dancers. In rare instances, disease or congenital abnormalities at the lumbo-sacral joint may prevent change in the antero-posterior obliquity of the pelvis. Ankylosis at the hip joint also may prevent any change in the pelvic inclination in the standing position.

From the Boston Home for Incurables, Boston, Mass.

The forward inclination of the pelvis is maintained normally by muscular contraction, various groups of muscles acting in opposition to each other. The muscles which are active primarily in this function are the gluteal muscles posteriorly, which pull the posterior portion of the pelvis downward when the leg is fixed, assisted to a certain extent by the biceps femoris, semitendinosis and semimembrinosis when the knee is fully extended; the adductor group of muscles with the sartorius and rectus femoris which pull the anterior portion of the pelvis downward when the leg is fixed, assisted somewhat by the iliopsoas muscles which depress the anterior part of the pelvis by increasing the lumbar lordosis. Above, the erector spinae group of muscles and the quadratus lumborum raise the posterior portion of the pelvis to a certain extent when the dorsal spine and ribs are fixed; the rectus abdominus and the anterior abdominal muscles raise the anterior part of the pelvis when the sternum and ribs are held in a fixed position.

This muscular control of the anterior obliquity of the pelvis is peculiar only to man and the other primates.[2] It is not found in quadrupeds. In the pronograde mammals the center of gravity falls between the anterior limbs and the middle of the body. The posterior limbs are organs of propulsion solely. The sacrum lies far in advance of the symphysis pubis and the coccygeal vertebrae are well developed, while they are rudimentary in man. In primates the changes in the pelvis have resulted from a change in the center of gravity and changes in the mode of locomotion. The iliac bones have become wider, with a greater flare to provide attachment for muscles which balance the superimposed torso. With this the femoral condlyes have moved forward to balance the body weight on a limited base. These modifications during ages of experimentation in the development of the upright carriage have produced a certain position and degree of forward inclination of the pelvis which can be changed by muscular contraction or relaxation or by changes in the thrust of the superimposed weight.

The forward inclination of the pelvis has been measured in various ways. It has received particular attention in obstetrics where it is of considerable importance in relation to the changing diameters of the pelvic inlet and outlet.[3] An apparatus has been devised[4] in which the patient stands for the measurement of the angulation of the diagonal conjugate, a line drawn from the first sacral spine to the top of the symphysis pubis. Naegele, whose name the diagnonal conjugate bears, measured the distance to the floor from the lower margin of the symphysis pubis and from the tip of the sacrum. The depth of the hollow formed by the lumbar spine has been used as an approximate index of pelvic inclination.[5] Measurement of the sacro-vertebral angle, the angle formed by lines bisecting the sacrum and the fifth lumbar vertebra in lateral roentgenograms, has also given an approximate estimate of the forward inclination of the pelvis. We have found the measurement of the angle, formed with the horizontal of a line projected from the first sacral spine to the upper margin of the symphysis pubis to be the most simple and efficient method of determining the degree of pelvic inclination, in reality the diagonal conjugate. The forward inclination of the pelvis, measured in this way, should normally be about thirty degrees with some variation for individual differences in anatomic structure.

There are many factors which tend to increase the forward inclination of the pelvis, but the commonest one is faulty posture. With a slump of the body there is a shift in the thrust of weight, and the pelvis which normally has its center of gravity just behind the acetabuli,[6] tilts forward to help in balance against the stress of gravity. Accompanying this there is increased anterior-posterior curvature of the spine particularly in the lumbar region. The ribs are lowered in this way, relaxing the origin of the rectus abdominus muscle as well as the attachment of the other abdominal muscles. The posterior portion of the pelvis carries the attachment of the gluteal muscle to a higher position. The iliopsoas tendon assumes a more vertical direction. The raising of the ischial tuberosity by the increased forward tilt of the pelvis pulls upon the hamstring tendons often leading to a hyperextension of the knees in the standing position. In the very faulty posture, this forward inclination of the pelvis may be as much as eighty degrees. Such increase from the normal angle of forward inclination, about thirty degrees, disturbs the function of the muscles which stabilize and move the hip joint.

It is well known that the stability of joints is dependent to a large extent upon their controlling musculature. The articular ligaments are the secondary supports which in normal function are not put under great tension. The action of the muscles in maintaining stability of joints is demonstrated particularly well in the lower extremity where weight bearing makes it more evident. The ankle joint and the posterior tarsal joints are readily strained whenever the muscular control is impaired. At the knee and hip joints muscular stabilization associated with proper osseous alignment and intact ligaments is just as important if less obvious. In partial paralysis, from whatever cause, of the muscles about the hip joint, particularly of the gluteal muscles, a limp is produced because of instability of the hip joint. At times through overstretching of the articular capsule actual dislocation of the hip joint may occur.

Various degrees of instability may result also from malalignment or bony malformation of the acetabulum or the upper end of the femur. Morrison[7] has shown that dislocation or instability of the hip joint may arise from failure in normal acetabular development. Soutter and Lovett[8] found that certain shallow types of acetabular development readily led to redislocation in reduced congenital dislocation. Congenital variations in the position of the acetabuli occur, as Harrenstein[9] has shown, which make it easier or more difficult for the muscles to maintain the normal position of the pelvis. Instability increases in all of these with increase in the forward inclination of the pelvis.

Instability may occur when there is a change in the tautness of the muscles or an alteration in the direction of their pull. If the superimposed weight is not properly aligned, there is less freedom of movement at the hip joint, and the position is maintained only with strain. The femoral heads fitting into the cup-shaped depressions formed by the acetabuli are held in place by the thrust of the body weight, by the articular capsule and ligaments, and by the muscles which surround the hip joint. Friedel[10] has traced out the pull of the various ligaments at the hip joint and has shown that their normal spiral course adds to stability. With increased forward obliquity of the pelvis, the ilio-femoral ligament, sometimes called the "Y" ligament of Bigelow, becomes relaxed and the spiral course of the other ligaments is changed. The more firmly attached and secure portions of the articular capsule and acetabulum are the superior portions which lose their protective action when the pelvis is rotated forward and downward. Todd[11] has shown that the muscles which move the hip joint are attached somewhat like the spokes of a wheel and that disturbances in the natural arrangement and relative tension of these various muscular pulls makes normal function impossible.

Interest was aroused in this problem of stability of the hip joint on the admission to the Boston Home for Incurables of several children with irreducible congenital dislocation of the hip joint. All had been subjected to unsuccessful attempts at both closed and open reduction of the dislocation. Physical therapy was first given to these children to improve the extremely atrophied musculature and to correct the abducted and externally rotated position of the thigh. Exercises for postural correction were also given. It was found that pain and, in one case, the limp disappeared as the extreme forward tilt of the pelvis was corrected. This was to be expected if Trendelenburg's[12] explanation of the cause of the instability of the hip in congenital dislocation is correct. He believed that the abductors could not hold the pelvis horizontal since the pull of the gluteus medius and minimus were changed because the pelvis was tilted markedly forward and the trochanter was too high. Huhne[13] who analyzed the mechanics of the so-called Trendelenburg sign, concluded that the two components of this sign, sinking of the pelvis toward the sound side and the forward twist of the pelvis, were due to disturbances in the function of the gluteal muscles from the changed osseous attachments, and to the relaxation of the ilio-femoral ligament.

Correction of the excessive forward inclination of the pelvis was also found helpful in relieving the disability and pain in old dislocations of the hip and in hypertrophic arthritis.[14] Relief in these conditions resulted from the decreased strain, the improved muscular function and the greater stability of the hip joint. The pain and osseous proliferation, found in both hypertrophic arthritis and old dislocations of the hip joint may well be due to the functional derangement resulting from the marked forward inclination of the pelvis. Fairbanks[15] has shown that the obturators, gamelli and quadratus femorus pull the head of the femur into the acetabulum when their function is not disturbed. Watson

Jones[16] has demonstrated that dislocation may occur at the hip joint from derangement of the normal muscular function alone. Saxl[17] believed that the weight thrust with improper alignment of bony structures was the most important factor in the causation of defective hip joints.

If these things are true, and verification is not difficult either clinically or anatomically, then correction of increased forward inclination of the pelvis is of importance in the care of all disabilities at the hip joint where continued function is expected. In the after-care of reduced dislocation it is important that the greatest improvement in muscular function and mechanical stability be secured. In congenital dislocations muscular action has a very important effect on the development of the pelvis. Janson[18] has shown that normal osseous development throughout the body is dependent upon muscular pull and gravity. Normal acetabuli will not develop in malalignment of the pelvis and femur.[19] Treatment should be directed first to correction of the faulty mechanics of the whole body, and then to further improvement in the alignment of the pelvis. Thirty degrees of forward inclination of the pelvis should be obtained if possible. In certain disabilities this amount of correction cannot be secured but a certain amount of improvement with improved function can be gained. At times sufficient functional improvement to make further treatment unnecessary will result.

Conclusions:

1. Excessive forward inclination of the pelvis is usually caused by faulty posture.
2. Increased forward inclination of the pelvis results in impaired function and decreased stability of the hip joint.
3. Correction of the excessive forward inclination of the pelvis is helpful in relieving disabilities about the hip joint.

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Toys, Games and Apparatus for Children with Cerebral Palsy

Gladys Gage Rogers and Leah Thomas

The search for toys, games and apparatus for children with cerebral palsy is nation wide at present. One director of Robin Hood's Barn has experienced seventeen years of searching for suitable toys. We have been asked to make a list of toys which we use for these children. The present article is the outcome of this request. However, it seems impossible to make this list without mentioning two far more important factors than toys themselves. One factor is the setting or environment in which the toys are used, the other factor is the psychology of their use. These factors are of paramount importance because the principles underlying the therapeutic value of using toys must be applied, not for a few years, but for fifteen or twenty years.

The child must discover the way open to him through his own efforts, an effort that calls into play all the capacity for activity that he has. We must see that a child has within his reach, if he will make an effort, toys that stimulate him to continued activity. This activity must bring satisfaction and a sense of accomplishment.

A specific example is the peg board which is well known to all. No child with normal mentality can be expected to enjoy placing pegs in this board for two or five years not to mention the possible need of this exercise for ten years. A step of imagination will lead us to realize that there is an equal amount of therapeutic value in placing faggots on a fire in an Indian village. The anticipation of lighting the fire in the evening when the hunters return with their deer is stimulation enough to lay a large fire of which the child may well be proud. This means that the exercise has been repeated willingly many more times than would be possible with a monotonous peg board.

The demand for persistence and exertion which does not bring satisfaction to the child, produces instead discouragement and an unwillingness to exert himself again. Ordinarily the little child has a strong desire to roll, creep, and later to walk. He will make vigorous effort to reach for and manipulate objects. Too often the handicapped child finds that his efforts have been futile; there is nothing in his environment that he can successfully control except his parent. If his own activity gives him no satisfaction, he will demand entertainment provided by others, or passively accept defeat. There should never be discouragement or impatience; never let

the child think you are disappointed, and always make him think he has done better than you expected him to. Remember that the tone of the voice means as much, perhaps more, to the little child than do the words. Some teachers advocate a daily chart for exercise to let the child watch the improvement curve. It seems wiser not to start the chart until you are sure that the daily improvement will be large enough to encourage him. To set a goal, "when you can walk," if far beyond the child's present ability, may be a discouragement rather than a stimulus. There should never be competition or a time element unless it is all made a happy joke. Daily exercises, under the direction of a person trained in this work, must keep the muscles in condition to function, prevent contractures, demostrate new motions, but the actual control of the muscles depends upon the purposeful effort expended by the child.

Each toy should be selected for its therapeutic value. The first principle is to make certain he will not be discouraged by finding it too difficult to manipulate. If the child is eager to play with a certain thing, complete frustration is apt to make him tense and nervous. A phlegmatic child will simply cease to try. Always have a suitable toy within reach which he can pick up and hold in his hand if he cares to. If it is something he enjoys, he does not think of it as an exercise, but as a game.

Education, play, and exercise should be of therapeutic value. These should go on continuously throughout the day without the child being conscious that most of his activities have been planned to this end. In this way far greater progress will be made than the usual half hour of intensive muscle training and little or no occupation for the remainder of the waking hours.

SUGGESTIONS FOR FINGER, HAND, AND ARM EXERCISES SITTING AT A TABLE

1. A musical dinner gong, such as is used in dining cars affords great joy.
2. Cover the entire table with a large sheet of paper tacked down with thumb tacks. Use large jumbo crayons which can be grasped easily.
3. Put paper clips on letters and words. Use magnet to draw out letters and form words—in same way draw out words to form sentences. (Milton Bradley school material.)
4. Magnetic toys demand less skill of motion than the above suggestion. (5 and 10 cent stores.)
5. Fishing with a magnet on the end of a string. Have fish in a basket and catch them by dropping magnet into basket. On each fish have a problem or letter or word. ($2 + 3 = 5$ or A, B, C, or ran—horse, etc.)
6. Dusting with a cloth always seems to give pleasure, and helps with big arm movements. A paper napkin in each hand to wipe the table is enjoyed a few times.
7. A large dish pan of water in which to push around floating toys.
8. A table with a two inch rim on three sides and one-half inch on front side will prevent toys from constantly dropping to the floor. Bore holes in opposite rims and tie strings in these holes so that the strings run lengthwise across the table. Fasten spools, buttons, beads, blocks on the strings. Use toys which may serve a constructive purpose. Count spools or buttons, learn colors with beads, name the animals, have letters or words on the blocks. If child is not old enough for this suggestion, tie on soft stuffed animals or dolls to play with. Stretch colored elastic bands across the table in the same way the string is fastened. Pull these bands forward, then let them snap back to place, knocking down wooden men or small toy nine pins. Count the pins and add the score each time.
9. A large plate of flour, make finger patterns.
10. Jack stones are too difficult to play the correct game, but children enjoy moving them about.
11. Printing pad, animal stamps as well as letters and words can be found for this.
12. Printing set or printaprimer.
13. Anagrams.
14. Make tracks like animals—use water color on end of fingers or make tracks in plastercane.
15. Small sand box on the table.
16. Bread dough—the children like the feeling of bread dough and will mould this long before they show interest in plastercine.
17. Clothes pins—these can be fastened together to make queer designs. This has an advantage of using both hands. A few colors or faces on the pins will make them more interesting. Push clothes pins or different shaped pegs into clay.
18. Roll balls across table—try to hit object. Rubber balls covered with worsted netting are desirable in certain cases.
19. Roly-Poly toys are excellent. One child made her first successful attempts with hand exercises playing with these.
20. Piling up bean bags is not so discouraging a task as blocks.
21. Tinker toys—these demand more degree of skill than most other suggestions.
22. Bead numerical frames—different colored beads are pushed back and forth on wires. Colors may be learned. Addition and subtraction in arithmetic may be made interesting.
23. A large peg board—put large different colored pegs in holes in board—then put a corresponding wooden colored cap on each peg. (Milton Bradley.)
24. Hammer and nail set. (Milton Bradley.)
25. Clay moulds.
26. Spatter work.
27. Soap bubbles.
28. Cut art stencils to crayon.
29. Large wooden beads—round and square—one-half inch to one inch size.
30. Bell—similar to those on teachers' desks.
31. A, B, C weaving looms.
32. Circular or straight knitting frames.

SUGGESTIONS FOR CHILDREN LYING ON A MAT ON THE FLOOR

If the child can lie prone this is the best position—he will then use his back and neck muscles to great advantage.

33. Small furry animals or rag doll to pick up.
34. Small bean bags—the shape of a half moon will fit the hand. Small turtles and a Chinaman that can be held by his queue are interesting.
35. Small bells to shake.
36. Rattles disguised with more grown up ornaments.
37. Rubber toys of all descriptions—when squeezed they make a noise or squirt water.
38. Blowing feathers.
39. Blowing or hitting balloons.
40. Jumping toys—bunnies, ducks and frogs which hop along by squeezing bulb.
41. Push around floating toys in low pan of water.
42. If outdoors—put mattress where child can pick grass, clover and wild flowers.

43. Place beans or wooden beads from one bowl to another.

SUGGESTIONS OF TOYS WHICH MAY BE USED SITTING OR STANDING WITHOUT A TABLE

44. Pretty boxes or toy eggs to open and close.
45. Leather string with soft toy on end to whirl around in big arm circles.
46. Toy clothes pins and line for doll clothes. a. wash tub; b. wringer; c. iron.
47. Wooden dishes.
48. Toy brushes with dust pan. Feather duster.
49. Dish mops with faces.
50. Building blocks of every description.
51. Extra large size pencils and crayons.
52. String to pull and ring a bell or a row of bells.
53. String to pull on and turn off electric light.
54. Watering pot—used in bath tub with great glee as well as out of doors.
55. Ball on elastic—this can be thrown at a distance and will come back to child.
56. Accordion.
57. Tambourine.
58. Drum.
59. Wrist bells.
60. Zylophone.
61. Harmonica.
62. Toy piano.
63. Other rhythm band instruments.
64. Blowing out paper toys—these are long narrow strips of paper with a feather on the end.
65. Sandbox—have a long narrow sandbox where the children may stand beside each other rather than opposite. This will prevent the accidental throwing of sand in other's faces. Children who cannot stand alone may be strapped to the box if given support around the hips and low back. Others can stand between a wall in back of them and the sandbox in front. Many of them stand in their walkers which may be pushed close to the sand.
66. Wooden sand toys.
67. Wheelbarrow—to fit particular child—this toy necessitates using both hands. This will be a great aid in maintaining balance, if instead of one wheel, two wheels are used across the front. These wheels are on an axle the same as two wheels from a doll carriage. Fasten the box part of the wheelbarrow on to this axle.
68. Doll carriage.
69. Toys on ropes to be pulled.
70. Small buckets to wind up on string or chain. These can hold water or sand and be drawn from over a wall.
71. Light punching bag—burlap stuffed with rags will answer the purpose.
72. Ring toss.
73. Ball board—balls roll on an incline and drop with a click into holes. Each hole is numbered and scores may be kept.
74. Waterproof dolls—these can be tubbed like real children.
75. Telephone with dial.
76. Raffia or yarn—if braiding is difficult strands of different colors may be wound around each other.
77. Toy money.
78. Cash register.
79. Inexpensive typewriter with letters on a dial.
80. Sewing cards.
81. Enlarged art crayons—wax, hexagonal in shape four and one-half inches long and one-half inch thick.
82. Large pencil—Eagle brand, 75-12 automatic, eight inches long, three-quarters inch in diameter.
83. Magnetized letters for a blackboard — they cling to the board or may be pushed about.
84. A bar or pulley handles.
85. Balloons.
86. Set of flags—twenty-three nations. (Educational Playthings, Inc.)
87. Telegraph set—a child may learn to tap by the Morse Code.
88. Winding mechanical toys or victrola.
89. Marbles.
90. Twister toys.

We suggest that mothers and physical therapists send for catalogues from

Milton Bradley Company,
Springfield, Mass.

Educational Playthings, Inc.,
20 East 69th Street,
New York City.

The Ideal Line—Distributed by
J. L. Hammett Co.,
Cambridge, Mass.

J. L. Hammett Co.,
Kendall Square,
Cambridge, Mass.

Childhood, Inc.,
32 East 65th Street,
New York City.

Montessori Material,
J. L. Hammett Co.,
Kendall Square,
Cambridge, Mass.

GAMES

Group games afford the happiest moments of the day. Almost every game must be adapted in some way for these children. Many of them are changed beyond recognition, but this in no way decreases the joy and good spirit of the games. Almost every child in our group has experienced from three to eight years of a lonely, inactive life. Each child has been the center of his own world. His life goes on at a tempo which he sets. His activities are governed by his physical limitations. His interests and education depend entirely upon those of his parents, many times one parent.

We believe for these children suitable group games will have education value. This type of child tends to react slowly to external stimuli. They are slow to think, to hear, to observe, to see and to do. At first many of them appear to be almost oblivious to what goes on around them. In proportion to the improvement possible with these children, we are certain they react to group games as favorably as a group of normal children.

Sense perceptions are quickened; each child grasps more quickly that it is his turn, that the balloon is coming his way, that he is in danger of losing by a wrong guess. He hears footsteps behind him. He soon knows what to do when his name or number is called. Willpower and inhibition develop through games. A social sense which leads to social cooperation and good will is, for these children, one of the most valuable assets to be learned through games. During the game hour they are in a world of many people. Since these children are alone so many hours of every day, the game time should be carefully planned to give them every advantage of group play.

Tests of skill or strength, methods of capture, running, competition and all the usual excitement which

accompanies games are barred to us. Such activities are not necessary because we must find games that have their value in a "carry-over" which can be applied in an inactive world.

Singing games are, no doubt, the best beginning for play with these particular children. They are simple in content, the pianist can set a slow rhythm and the activity naturally cannot extend beyond what the piano is telling us to do.

To the surprise of the adults in the group "Ten Little Indians" served a bigger purpose than ever before in the history of its being sung. During Indian week we come to assembly dressed as Indians. There are one, two or three feathers in our hair. Some of us carry newspaper tomahawks, while others carry tom-toms made of oatmeal boxes. The pianist surprised us all by arriving with a papoose strapped to her back. The day before we made a teepee and laid the fire mentioned elsewhere in this chapter. We have had real Indian dishes at meals and we have read Indian stories. So, this morning at assembly we are not playing Indians, but we are actually living Indians, and we are living the Indian stories we have heard for the first time.

In such a setting we are not going to have time to regret that we cannot hide in ambush and spring upon the enemy or that we cannot perform the authentic war dance. It is enough for us to be content with less. We are all sitting in a circle. One child is named as the first Indian. As we sing "One Little Indian" he stands before his chair—"Two Little Indians," the next child is helped to his feet and then he proudly stands alone to the end of the verse. "Three Little Indians," the next child is helped to stand and is assisted in standing throughout the verse. When ten little Indians are standing the first verse is ended. Beginning with the tenth Indian we sit down, one by one, as we sing through the second verse. The children loved this song and frequently asked for it. The action is so simple that we can readily assume that each child felt a satisfaction in doing his full share in the group activity. There is no reason for apologizing for this simplicity in action because at four, five or six years of age, many times standing up and sitting down are envied performances which these children have seen accomplished by other children, whom they secretly know are still babies. It is a valuable exercise for these children to stand up and sit down to music. They are so distracted by the fun of doing it this way that most of them do not seem like the same children attempting to stand at the direct command of an adult.

We have a prayer to the Indian Sun God. The children refuse to be left out of this worship. A councilor with perhaps less spiritual enthusiasm for this particular form of worship, kneels beside a child who needs assistance, holds him in balance and raises his head, arms and hands in benediction. In circle formation we are kneeling on the floor. The body is bent forward with the head touching the floor and arms extended forward overhead. As we sing, "Wa-Kon-da-dhe-dhu. Wa-pa-dhin-a-ton-he," we raise our heads from the floor and extend the arms upward to the sky.—During the second verse we return slowly to the starting position. The difficulty in balancing is somewhat forgotten by the aid of the soft flowing music. Before Indian week is over most of us have learned to do this exercise in a more relaxed degree than we did at our first attempts.

Indian music and Indian dances give us many avenues leading directly to beneficial muscle training. Of equal importance is our endeavor to create so vivid a story of Indian life that our week of Indian games may be the foundation of a real and lasting interest in Indian history. We aim to make the high points of each week so broad and far reaching that these interests will grow, and leave less time for regrets that our physical prowess is not greater.

"How do you like to go up in a swing" a song with words by Robert Louis Stevenson, music by Reginald de Koven is another favorite. We stand in a circle, partners facing each other and holding hands. Last summer we had three "walkers" in the circle. Through the verses and chorus the arms swing from side to side in slow rhythm. During the chorus "Swinging, swinging, swinging, etc.", one child runs under the swinging arms and continues around the circle until the music stops. When the song has been learned thoroughly and the first enthusiasm is lessened by repetition, select a child in one of the walkers to go around the circle as the others have done in turn. There is a hushed outstanding joy surrounding the group as each set of couples silently moves to adjust the formation of the circle to allow adequate space for the walker. At the suggestion of the children this game never ceased until, with awkwardness and patience the other two children in walkers had been pushed around with the gaiety and spirit of fairy dancers. We had all danced a solo part from start to finish. The mother of one of our oldest children told us that her daughter had been practicing standing alone during the winter, because she enjoyed the dance so much she wished to show us her improvement in executing it the following summer. She did accomplish this end.

The action of the words in "Hansel and Gretel Dance" can well be carried out sitting in a circle. Instead of turning in place standing as we sing "Round and round and back again" we make big arm circles.

Another game is that of rolling a big ball across a circle trying to make it go out between persons in the circle. It is called Circle Stride Ball on playgrounds. We sit in a circle and allow the children to kick with the feet or hit with the hands. This is an excellent game because there is no waiting for the slower children. The ball is always in play. Within a short time there is marked improvement in skill.

It is impossible to give further details of games but a short list of those we have used successfully follows:

Singing Games

Oats, Peas, Beans and Barley Grow	Nuts in May
Shifty Shadow	The Steeple Bells
Did You Ever See a Lassie?	Snail
Farmer in the Dell	Row, Row, Row Your Boat
Looby Loo	Little Bo Peep
Muffin Man	Sing a Song of Sixpence
Mulberry Bush	My Old Dan
	Round and Round the Village

Games Without Music

Balloon games	Hide the Thimble

Guessing Games

One variation we make is to whisper to one child some action which he can do while the others guess—such as an airplane or shoveling coal on the fire, going upstairs.

Simon Says.

Pass two bean bags around circle.

Nine Pins.

Games which children may play in smaller groups according to physical limitations

Croquet.

Dart game—we hesitate to mention this but the

children ask for it daily. It is a special favorite for rainy days.

Simple ball games with enough councilors to keep the ball in play.

Tether Ball.

Bean Bag.

Peggoty.

Throwing dice for many games where men are moved about on a board.

Spinning for numbers to move men in such games as mentioned above.

Dominoes.

Tit tat toe.

APPARATUS

1. A rather heavy table similar to the old fashioned kitchen table is very useful. Cut a round hole in the top eight inches in diameter. Put wooden rims, two inches high on all four edges of the table. This will prevent play toys from dropping to the ground. The child can stand inside this table and have excellent support. Casters on the legs for indoors or larger wheels for out-of-doors will allow the child to move about and make the play time more interesting.

2. A small table with the legs cut short the correct height for the child when kneeling is excellent for children who cannot stand, but can kneel. If they fall because the knees slip forward under the table, place a board in front of the legs at one end. This gives the child a chance to brace his knees. With this support at the knees and the top of the table giving support at the height of the chest, children can crayon, look at books, or play games on the table. Children will remain in this position for a long time without fatigue. It is an important step toward improving balance.

3. Jungle gym—during the summer we live in medieval England, so, the jungle gym is not a jungle gym, but a beautiful castle which stands near Sherwood Forest. There are several long lanes of pipes leading to it. These are not pipes to which we must cling and pull along to reach the framework and there attempt to do certain exercises we have tried to do for days or weeks past. These pipes are avenues leading to the castle to which we have been invited to make a visit. We frequently refurnish the castle and then we explore from top to bottom and tell what we find as we travel from room to room. Knights in armour on white chargers are sometimes at the door and we go racing off with them after the castle inspection is over. Beside the jungle gym are sand tables by which the children in walkers are playing. They can hear the conversation during the castle adventure and frequently the piles of sand tell the same story of the beautiful castle and its white chargers.

4. A ladder will be found more useful if it is fastened to the side of the wall. This will give support to the toes and prevent the feet slipping forward as the foot is placed on the rung. This ladder may well serve as the bar on which the child may pull himself from a sitting to a standing position.

5. A see-saw is enjoyed. At each end in front of the sitting space have an upright with handles to which the child may cling or be tied with straps.

6. Heavy book racks similar to music stands may be placed by the tables in which the children stand. There is no possibility of the child hitting this with his hands and he may read or ask another child to turn the pages as they look at pictures together.

7. Tricycle—fasten a board six inches wide, vertical to the rear axle. It should extend from this axle to a height of the child's head. Fasten it at the axle and back of seat. Strap the child to this board with one strap under his arms and another around his hips. Tie the feet on to the pedals with two-inch straps made of inner tire tubes. These are strong and will cling to the foot, the ankles and the pedals the same as a bias piece of cloth. Tie the hands securely with bandages, over and over the handle bars and around the wrists. Fastened this way, a child of tetraplegia type felt so secure that she would relax and ride up and down the corridors and in the ward of a hospital. Within a few weeks she could travel about alone. When sitting at a table she could not control her arm movements. Her fingers were in constant motion and she could not pick up any thing from the table. With her hands tied around the handle bars and feet tied to the pedals she gained muscle strength and coordination in learning to steer and pedal.

8. A velocipede is better for some children than a tricycle.

9. A blackboard serves many purposes. Lines and circles drawn to music are helpful. If the child cannot hold an eraser, a dust cloth will serve as well. Chalk can be purchased one inch in diameter. Tie this to a string fastened to the top of the frame to prevent the chalk from falling to the floor. Magnetized letters will cling and can be pushed around on the board. We have found that sticking an end of the chalk in a soft ball or inside of a ball of cotton is an aid in helping the child hold it.

10. Ramps used instead of steps by the porches are as valuable as any apparatus we have found.

Irradiated Blood Transfusion

In Treatment of Infections

Virgil K. Hancock, M. D.

Mr. E. K. Knott

General potentialities of ultraviolet have long been recognized and used by the medical profession in the treatment of various disorders. There is a vast amount of scientific knowledge available to those interested in its therapy. General systemic treatment in its broadest sense has characterized its use by physicians. The specific application of ultraviolet in its more detailed potentialities has been so far confined largely to research laboratories. These have placed at our disposal much definite information concerning it and its application in restricted and specialized fields.

This work done by various authorities has excited

our curiosity, and is the basis for the results obtained by us in the treatment of blood stream infections. When bacteria have entered the blood stream or have become lodged under even the thinnest layer of tissue, they are protected against bactericidal affect of radiation and can be destroyed only by the indirect stimulation of normal cells to combat by their increased activity such infectious organisms.

We have developed a method and means for treating blood stream and other pathologic blood conditions, and by this treatment to destroy infectious bacteria, stimulate normal blood cells, and inactivate toxins by the use of ultraviolet rays. The phenomena of ultraviolet irradiation are generally known and are utilized in the treatment of external infections. The principal object of our method, therefore, is to use effectively these phenomena in the treatment of blood stream infections and infections reached by the blood stream. We find the toxins in the blood stream that we have exposed to ultraviolet irradiation have been inactivated. Clinical experiments have further determined a beneficial energy stored up in the rayed blood temporarily, and if such blood can be returned to the blood stream immediately after it has been irradiated, it will throw off secondary irradiation which will stimulate and energize the patient.

We attain our object in a practical manner by: 1, tapping one of the patient's blood vessels, removing a small portion of the blood, citrating it, and irradiating it in a closed air-tight conduit, having one section permeable to ultraviolet radiation possessing bactericidal properties; 2, and by forcing such blood through the section while it is exposed to ultraviolet radiation, then returning it to the circulatory system (fig. 1). The portion rayed at one operation is predetermined by the patient's vitality, his immunity, his hemoglobin, red blood count, and white and differential count, the type rapidity and number of growths of the colonies on the culture plates or tubes at twelve-hour or other suitable intervals.

The operation is repeated until a sufficient number of the infectious bacteria have been killed, normal cells have been stimulated, and a sufficient amount of toxins have been inactivated to permit the normal systemic functions to take care of pathologic conditions without further external aid.

The different bacteria to be destroyed contain various amounts of photosensitive amino acids. The tyrosin content of amino acids in the bacteria is approximately six times greater than that of normal cells. Tyrosin, being very photosensitive, causes absorption of ultraviolet in the bacteria to the point of coagulation, while the same exposure merely stimulates normal cells.

As an example: Cultures of human blood containing staphylococcus aureus were irradiated for the following exposures: 0, 5, 10, 15, 20, 30, 35, 45, 60 and 70 seconds. Cultures were taken after each exposure, showing growth only on the first three cultures and no growth after ten seconds exposure. There was no change in the form of the blood cells up to 70 seconds. Then slight poikilocytosis was noted.

Mr. E. K. Knott has done work along this line for a period covering the past seven years, largely with dogs, infecting them with various staphylococcic and streptococcic bacteria in the blood stream and treating them at various intervals during the stages of the infections. The control animals die on the seventh and eighth days. Dogs were taken as late as the morning of the seventh day, irradiated and a recovery effected. All dogs treated showed negative cultures on the third to fifth

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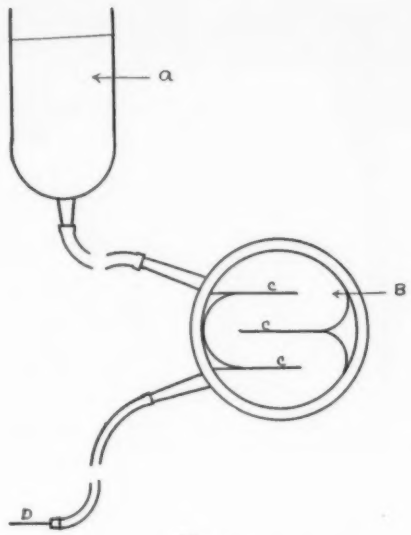

Fig. 1.

A. Citrated blood being returned by gravity.
B. Irradiating chamber with quartz window.
C. Boffel plates.
D. Needle through which blood is put into the vein.

day after treatment. It was found, however, that care had to be exercised in determining the amount of blood to be irradiated, because when too great a volume was so treated, anaphylaxis occurred with fatal results.

A typical case covering the treatment of the dogs we give as an example:

On the first day a dog, weighing approximately fifty-five pounds, and five years old, was injected intravenously with a normal salt suspension with approximately five hundred million organisms of streptococcus hemolyticus. On the second day the animal appeared toxic and refused food, and its temperature advanced from normal to 103°. On the third day it still refused food, temperature advancing to 104° and its axillary and inguinal lymph glands became enlarged. On the fourth day its temperature advanced to 106°, the glands enlarged substantially and the animal was unable to stand. Its weight fell off to forty-six pounds.

A blood culture was taken which was found to be positive and identified as streptococcus hemolyticus. At this point the animal was rayed by treating 350 cc. of its blood. The rate of flow through the exposure chamber was adjusted so that each cc. of blood was rayed for approximately twenty seconds, the generator being approximately one centimeter from the window of the exposure chamber.

The following day, the fifth day of the experiment, the dog's temperature receded to 103° and its lymph glands became smaller and softer, it drank milk, and its blood cultures were negative on the seventh day. Its temperature receded to 101°, its lymph glands were almost normal, the dog became active and ate more food. On the ninth day the animal was apparently normal and its lymph glands were not palpable. On the tenth day its blood culture was negative and it was pronounced normal by a veterinarian and the dog advanced in weight to fifty pounds (fig. 2).

This dog was under observation for a period of eight weeks and at the end of that time was normal, its weight having increased to fifty-seven pounds. The blood cultures were still negative.

The work done on these animals was later rechecked

by the Pacini Laboratory of Chicago, and its results checked with those of our experiments. A copy of this correspondence is on file.

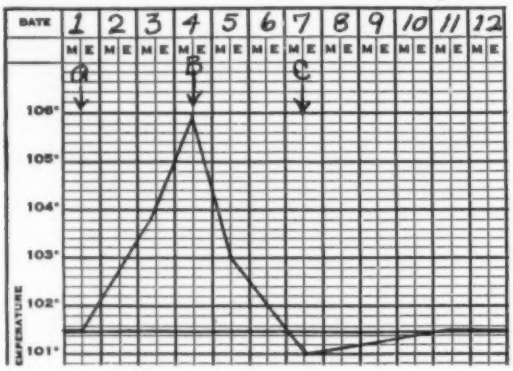

Fig. 2.

A. First day injected approximately 500,000,000 hemolytic streptococcus intravenously.

B. Irradiated 350 cc. of dog's blood twenty seconds for each cc.

C. Blood cultures negative and remained negative.

Secondary radiation, upon which depends much of the success of the treatment, is explained in detail by Dr. Frank T. Woodbury of New York City, of which we quote in part:

Paragraph 18. "Secondary radiation which comes from the surface cells may be detected and examined by appropriate instruments. When it contains wave lengths lying within the limits of the luminous spectrum, the phenomenon is called fluorescence. It is erroneous to recognize only the visible fluorescence and ignore the accompanying invisible secondary radiation."

Paragraph 22. "It has been observed that when certain photodynamic substances, either organic or mineral, are taken into the blood stream, either by absorption from the digestive tract or by intramuscular injection or by intravenous injection, they produce a reaction resembling very closely the natural photoallergy just mentioned. It may be spoken of as induced photoallergy."

Paragraph 8. "Biologic reaction being a resultant of selective absorption of wave lengths of radiant energy modified by the form of energy into which the radiant energy is transformed in the cells and by the vital individuality of the absorbing cells and by the reflex and remote effects of this conversion of energy, it follows that reaction of the individual to the form of irradiation which he received, together with the area irradiated, all together make up the criteria for dosage in each particular case. No procrustean technic or dose can be prescribed for all cases alike."

Sub. B-8-par. 23. "Induced photoallergy increases the oxygen absorption of the blood over fifty times its normal capacity, and as observed in animals the local inflammation is or may be so intense as to destroy by necrosis the abdominal wall and the anterior surface of the stomach, liver and colon."

As we expected from the research work done with dogs, and literature on other research work, we have obtained very gratifying results in treatment of blood stream infections in humans. We submit two of these cases for your consideration:

Case 1. Mrs. G. G., Oct. 14, 1933, patient was admitted to Virginia Mason Hospital, giving history as follows. Last menstruation Aug. 2, 1933. Usual signs of pregnancy until Sept. 30; from this date normal menstrual flow until Oct. 13, 11:40 p. m., when she had a severe hemorrhage and passed some membranes.

Physical examination showed abdominal scar, the result of appendectomy and oophorectomy; uterus almost to umbilicus, firm, not tender; no fetal heart tones heard; moderate amount of vaginal flow; head, lungs and heart negative; temperature 99°, pulse 84, respiration 18.

Temperature remained normal until Oct. 23, nine days after entry to hospital. Patient did not respond to pituitrin and hot packs.

Oct. 24. Consultation. Dilatation of cervix and induction of labor advised. Dilated the cervix slightly, inserted small rectal tube 10 a. m. That afternoon patient expelled small piece of placenta tissue size of three fingers and rectal tube.

Oct. 25. Septic temperature began.

Oct. 27. Bougie bag inserted, later expelled, producing but little dilatation.

Oct. 28. Consultation. Advised making attempt to empty the uterus under ether. Patient's temperature now 103.6°, pulse 150, respiration 20. Dilated the cervix. It was filled with multiple fibroids; posterior cervical tear, able to insert one finger. Used a sponge forceps in the uterus; lifted out a pedunculated fibroid, and determined that the canal of the uterus was very tortuous and filled with projecting fibroids. Repaired cervical tear. Injected two ounces of iodine into the uterus under pressure, at 5:40 p. m.

Oct. 29. Temperature dropped to 97.6° and pulse 84, at 4 a. m.

Oct. 29. Temperature 105° to 106° each day until Nov. 8. Temperature brought down each day with iodine injections into the uterus.

Nov. 2. Blood culture in forty-eight hours showed gram-positive diplococci, few in chains resembling streptococci. Blood transfusion, 250 cc.

Nov. 4. Blood transfusion, 175 cc.

Nov. 7. Blood culture in forty-eight hours showed colonies of hemolytic streptococci, but increasing in number on the agar plates.

Nov. 8. Blood transfusion, 300 cc. from donor and 100 cc. of citrate, which was irradiated thirty seconds for each 10 cc. of solution.

Nov. 11. In forty-eight hours both showed gram-positive diplococci blood agar plates with few colonies of hemolytic streptococci, about two colonies to the plate, where before irradiation there had been ten to twelve colonies.

Same date irradiated 400 cc. of citrated blood, thirty seconds for each 10 cc. of solution. Also took 100 cc. of patient's blood, citrated it and irradiated it thirty-five seconds for each 10 cc. of solution. Hemoglobin at this time was 75 per cent and red blood cells 2,960,000. Four days later, on Nov. 15, the hemoglobin was 89 per cent and red blood count was 4,550,000.

Nov. 13. Still a few hemolytic streptococci on forty-eight-hour cultures.

Nov. 16. Blood cultures, forty-eight hours agar plates negative; brain broth negative.

Nov. 18. Few positive in forty-eight hours taken on Nov. 16.

Nov. 20. At forty-eight hours both negative, taken on Nov. 18, eight days after the second radiation (fig. 3).

Nov. 23. Cultures taken on the 20th, seventy-two hours, negative in broth and plate.

Dec. 4. At seventy-two hours negative.

Dec. 9. At seventy-two hours both negative.

Dec. 20. Irradiate 400 cc. of citrated blood, ten seconds for each cc. of solution.

From Oct. 27 to Dec. 8, the patient had extreme

septic temperatures, despite blood transfusion, intravenous mercurochrome injections, and remained critically ill. On Nov. 9, the first day after the irradiation, the temperature dropped from 105° and 106° to 103°. The next three days the peaks were 102°. Then the peaks ran to 101° until Nov. 20.

From then for two weeks, until Dec. 6, the average temperature for the day was around 99°. When the patient menstruated, the peaks again averaged around 103° until Dec. 20, when a transfusion and irradiation were done. The peaks dropped to 102° until Dec. 28, then dropped on down to normal. In spite of the fact that the cultures have remained negative since Nov. 18, the patient gets considerable absorption from the uterus, and it is planned to do a hysterectomy at the opportune time.

Case 2. B. H. On Oct. 12, 1933, patient admitted to Children's Orthopedic Hospital, giving history of sore throat one month ago, followed by earache, drainage developing six days ago. Swelling in front of ear with tenderness last four days. Temperature elevated. Radiograph shows right mastoid cells clear, left decidedly cloudy. Leucocytes 14,300. Polys. 75 per cent.

Oct. 13. Simple mastoid done by Dr. Brugman. Cortex thick and hard; free pus under pressure in tip. Pus coming from perforation in zygoma. Pus in contact with dura which was covered with exudate. Simple mastoid incision. Periosteum raised over zygoma until pus released. Mastoid cells and zygomatic cells exenterated. Pus in contact with dura. Lateral sinus exposed. Cultures, heavy growth of hemolytic streptococci. Smear, many pus cells and short chain streptococcus organisms present.

Nov. 4. Discharged, out patient dressings.

Diagnosis, acute mastoiditis, left, with subperiosteal abscess.

Nov. 28. Mastoid wound healing satisfactorily. No discharge.

Dec. 5. Obstinate cold. Nose drops given. Wound healing.

Dec. 11. Temperature 103.4°. Develops fever, chills and cough; inflamed throat.

Dec. 12. Child appears ill. Coryza, ulceration of the lips, tongue strawberry color. Pharynx injected. No rales.

Dec. 13. Patient readmitted to hospital. Temperature 104.8°, pulse 160, respiration 30. Irrational at times.

Dec. 15. Temperature continues 104°. Has developed paralysis of right arm. Throat red, tongue red, neck rigid, moves right arm but not fingers. Reflexes present in all forearm muscles. Child delirious. Mastoid draining slightly. Spinal puncture, 30 cc., slightly cloudy fluid.

Dec. 16. Paralysis more spastic. Some flaccid paralysis of the right arm, also tendency to weakness of right foot. Eye grounds normal. Spinal fluid cloudy, 19 mm. pressure.

Dr. Swift, in consultation on the same date, reports child mentally somewhat dull, possibly from codeine and pressure, aphasia. Eyes, no pupillary changes, discs normal. No evidence of choke. Mouth, paresis of right face and tongue directed to right. Neck, rigidity. Reflexes, KK and AK increased. No clonus. No Babinski

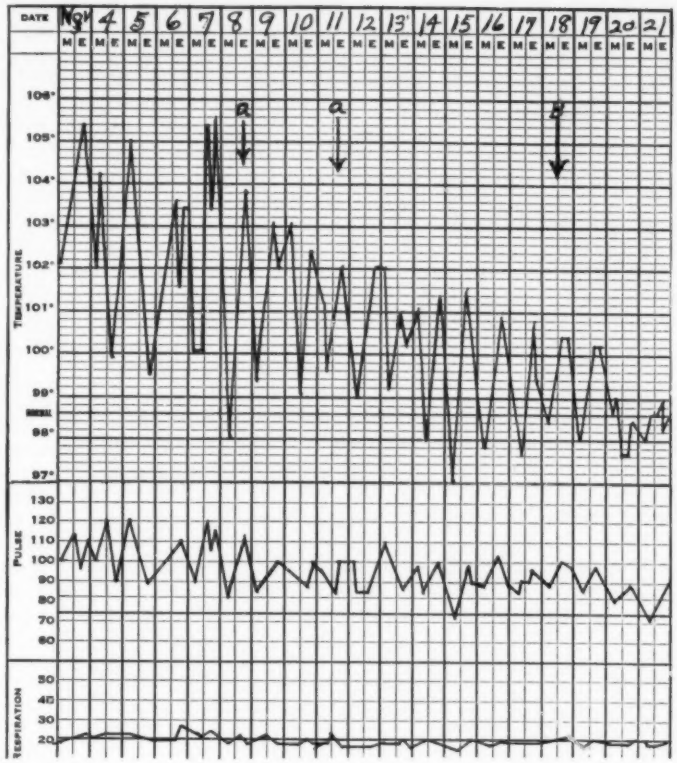

Fig. 3.

A on Nov. 8. 300 cc. donor's blood irradiated twenty seconds for each cc. A on Nov. 11. 400 cc. donor's blood irradiated thirty seconds for each cc. and 100 cc. of own blood irradiated thirty-five seconds for each cc. Blood cultures taken on Nov. 18 and after, negative.

or Gordon. Weakness of right leg. Paralysis of right arm. Looks like case of meningitis, middle fossa. Advises (1) spinal drainage, (2) blood transfusion, possibly irradiation of blood.

Dec. 16, 8 p. m. We irradiated 100 cc. of patient's blood with 50 cc. of citrate, thirty seconds for each 10 cc. of fluid. Within an hour and a half the patient was much clearer mentally, skin became pinker. Spinal puncture done at midnight, 30 cc. removed. Patient quiet and tends to sleep.

Dec. 17. When visited during the morning the patient is laughing, says "no," and shakes her head when asked if she has a headache. Condition improves in morning. Temperature 102°, pulse 110. Patient trying to talk and says a few words. Seems rational. Paralysis is not extending. Throat is nearly cleared. At 5:50 p. m. same day, child is not so well. Has twitching and later severe convulsions, including the right side, hand, face and eyes.

Dec. 18. Early in morning, morphine, ⅛ grain given. Convulsions ceased in about one hour, free for forty-five minutes and then more severe, cyanotic at times. Artificial respiration given at intervals, depending on diaphragmatic spasm. Blood transfusion of 60 cc. at 12:25 a. m. Continuous spinal fluid tap was started at 2:15 a. m. Convulsions became less severe and at 5 a. m. patient became conscious. Has improved since and now takes fluid readily. Eyes show no edema.

This evening the patient still has convulsions of a twitching character on the left side. No vomiting. Spinal puncture at noon, drawing off 30 cc., and 20 cc. at 7 p. m. Pressure on last tap down to 10 mm.

At 10:15 p. m. we irradiated 70 cc. of blood, 40 cc. of citrate, thirty seconds for each 10 cc. of fluid.

Later 500 cc. of glucose are given intravenously. Patient had two convulsions during the intravenous and feels sleepy following.

Dec. 19. Child much improved. Can speak, and move the right hand. Mind is clear, but patient has difficulty in thinking of the word she wants to use. At 7 p. m. 30 cc. of clear spinal fluid removed, and was under 12 mm. pressure. Condition very much improved. Temperature normal, pulse regular and strong; paralysis and aphasia decreased.

Dec. 20. Condition improved. Patient retains fluid and solid foods; 15 cc. spinal fluid removed, under 12 mm. pressure.

Dec. 22. Child much improved. Temperature normal, pulse normal. Slight improvement in paralysis. No pressure symptoms present other than local paralysis.

Dec. 25. Condition continues to improve. Patient is comfortable, eats well, temperature normal.

Dec. 27. Temperature has been down since above note. Paralysis slowly improving. Patient can say a few sentences.

Dec. 30. We irradiated 120 cc. of blood and 25 cc. of citrate at 10:45, thirty seconds for each 10 cc. (fig. 4). Condition has shown steady improvement for the past ten days.

Jan. 1, 1934. Pupils equal and react to light and accommodation. No nystagmus. Right facial paralysis. Hearing o. k. in both ears. Weakness of right side of body with some atrophy. Reflexes hyperactive on right side with some clonus of right ankle. There is right foot drop. Sensation does not appear to be greatly affected and right side ataxia is probably due to weakness rather than incoordination. No pyramical tract signs on either side, and abdominal and epigastric reflexes on the right side are weaker than on the left. Both disc margins clear. The cup is deep but there is some elevation of nerve head. Vessels are slightly engorged and retinae are somewhat more red than normal. Cell count seems to be improving. The paralysis of the right side is improving rapidly. The aphasia is also improving.

Jan. 4 Condition continues to improve. Foot moulds applied to correct foot drop.

Jan. 8. Seen by Dr. Swift, who examines the eyegrounds. No evidence of intracranial pressure. Symptoms due to a plastic exudate of the meninges of the left hemisphere.

The results we have in our treatments are perhaps attributable to the various reactions that ultraviolet irradiation causes. In our opinion the following findings by various research laboratories, together with our own conclusions, are the probable explanations of the responses we have obtained.

1. Coagulation of bacteria (Steinmetz) and in our opinion creating an autogenous vaccine.

2. Increasing germicidal properties of the blood and antibodies.

Secondary radiation (Woodbury), which in our opinion causes stimulation of endothelium cells, hermatoblast cells, and general stimulation of endocrines.

4. Increased vitamin D content of chloresterol in the blood plasma (Steinbach).

5. Increased oxygen absorption of blood (Woodbury).

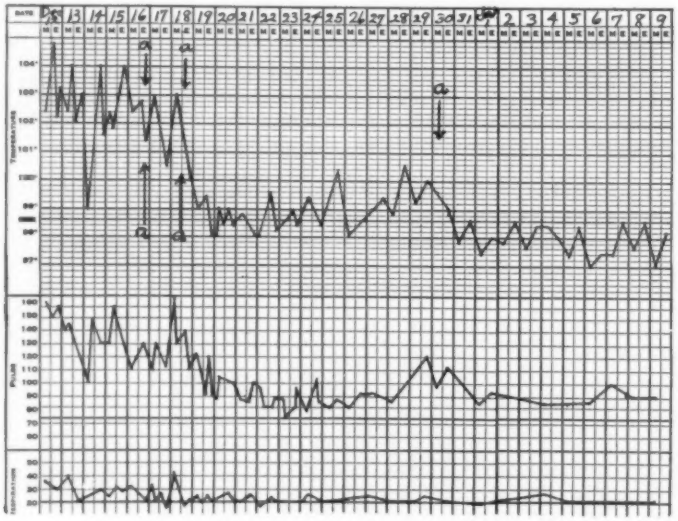

Fig. 4.

A on Dec. 16. Irradiated 100 cc. own blood thirty seconds for each cc.

A on Dec. 18. 70 cc. own blood irradiated thirty seconds for each cc.

A on Dec. 30. 120 cc. own blood irradiated thirty seconds for each cc.

The Physiotherapy Review

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Our Profession

At the convention in Cleveland, the question of ethics came before the delegates and the members of the American Physiotherapy Association. A temporary committee was appointed to look into the immediate problem, and a later report revealed the necessity of a code of ethics which would be more specific than the then existing constitution provided. That event and the probability of the presentation of the same question at the next convention, may well turn our thoughts toward a personal inspection—an inspection of ourselves as individuals and as an organization.

Generally speaking, there are three main classifications of pursuits—there is a trade, there is a business, there is a profession. Again generally speaking, the one who follows a trade does a rather specific piece of manual work keeping one eye on the clock and the other on the union; the one who follows a business keeps one eye on the work and the other on the balance sheet; and the one who follows a profession professes to look beyond the clock and the balance sheet, even beyond the piece of work at hand, into a field where stand the achievements and the possibilities of that profession. In other words, as Funk and Wagnalls' dictionary puts it, a profession implies scholarship; and scholarship implies something of a departure from purely selfish reasons for the pursuit.

Physical therapy, we believe, is a profession. It is, likewise, a profession in which there has been achievement and in which there are many possibilities. One need only glance back over the recent years since the war to see both. There is good reason for those doing physical therapy to feel something of the underlying importance of the work and something of the satisfaction of a detached interest in a pursuit which can return more than a mere livelihood.

It is true, of course, that prideful interest in any work, professional or lay, will make that work more stimulating to the individual; but it is especially true of a profession like physical therapy. The daily task of giving treatments is not so many hods of coal put into the basement, or so many bricks piled into a wall, or so many letters clicked off on the typewriter, or so many business deals closed; it is the giving of better physical being—and mental too—through the prescribed orders of an attending physician, who, likewise, is occupied with a pursuit the lure of which is something more than mere financial gain. In the work of physical therapy there can be a lasting effect to the one giving the treatment as well as to the one receiving it. A business deal closed, is a deal closed. But an arm or a leg or a back made better is a spiritual service which can "carry on" in the life of that individual and many others, as well, who may benefit by previous experience. It is the knowledge and appreciation of this fact that can give to the professional worker a satisfaction above that of workers following other pursuits.

Ethics, as such, can be observed and practiced to the complete fulfillment of a code; yet the observation may be only an obedience to the letter of the law. To be sure, such obedience is far preferable to no obedience. Physical therapy would be in a sad way if its technicians did not observe the letter of the law, and the American Physiotherapy Association would be in a sorry pligl.t if its members ran wild with individual liberties. Like a nation, an organization must be governed by rules, partly to control the possible violators, and partly to set a standard by which the fair-minded may guide their ways. But neither a nation nor an organization thrives and progresses by the works of those who must be restrained. It is those with the true professional attitude who not only set the standard, but, more important, carry it along.

This is not sentimentalism—it is a truth which any real scholar will uphold: a work performed for its own sake, regardless of financial returns, is bound to act like a boomerang, and will come back to the sender in the form of spiritual satisfaction. Herein, exists the difference between a lay worker and a professional.

The 1935 Convention

The Pennsylvania Chapter will be pleased to extend a most cordial welcome to the members of the American Physiotherapy Association, when the members meet for the annual convention, at the Hotel Dennis, Atlantic City, New Jersey, on June 11, 12, 13 and 14, 1935.

The Hotel Dennis is in close proximity to the new

Union Station, and only a five minute stroll on the Boardwalk to the Auditorium which is the headquarters of the American Medical Association.

The meeting rooms at the Dennis are large and restful. We are assured that everything will be done to make the convention a success. The management is very generous in its provisions for the needs of the convention and will do everything possible for the delegates. We suggest that, as far as possible, delegates and members secure reservations there.

Atlantic City provides the perfect meeting place. Conventions held in Atlantic City are always especially well attended because here may be combined attendance at Convention sessions with a healthy vacation for the delegates, and members, and guests.

Pennsylvania Chapter.

Convention Notes

The National Executive Committee through the Program Committee is planning three panel discussions to be included in the 1935 Convention Program. These discussions, if they are to be of any value, must be on subjects that interest the members of our association. Therefore, will you send immediately to the National Convention Chairman topics for these discussions. We will choose from your suggestions the topics that seem to represent the choice of the largest number of people.

An explanation of a Panel Discussion as described by Miss Mary Jo Shelly, in the report on the Conference of the National Association of Directors of Physical Education for College Women, follows. It is such an excellent description that it seemed wise to quote it in its entirety.

EXPLANATION OF A PANEL DISCUSSION

Purpose:

A panel is a conversational discussion of a given topic among especially qualified persons carried on before an audience under a chairman. The purpose of the discussion is not to reach a decision, but to explore the topic from as many angles as possible and from different points of view. It is not a series of speeches. Remarks extending beyond two minutes constitute a speech. It is not a debate. Questions but not criticisms, are appropriate; replies but not rebuttals are in order. The manner of discussion is informal, spontaneous, and friendly.

Procedure:

The group is seated in a semi-circle facing the audience with the chairman in the center. The presiding officer of the session introduces the occasion and the members of the panel. The chairman of the panel then opens the discussion by briefly summarizing the nature and function of a panel, and by stating the theme and its salient aspects. The chairman is allotted no more than five minutes for her introduction. At the conclusion of this introduction, any member of the panel may voluntarily initiate discussion of the theme by expressing a point of view on some leading aspect of it. From this time on, panel members continue the discussion at will, offering opinions or points of view in concise form, and asking and answering questions of one another. Members do not address the chair but every member will, when she wishes to speak, accept a cue from the chairman who may, if necessary, intervene in order to distribute the discussion among all members. Members speak as often as they choose, but the chairman will be allowed to steer and organize the discussion so that issues will emerge clearly. At the expiration of the time allotted for this closed phase of the discussion, the chairman throws it open to the participation of the audience, which may then state opinions or ask questions of panel members at will. To close the session, the chairman makes as inclusive and impartial a summary of the discussion as possible.

Advance Preparation:

Members of the panel should be quite clear as to the procedure, and have formulated a point of view on the theme.

Suggestion:

Avoid making a speech and any appearance either of formality or of conflict.

Please let me hear from you immediately, individually or by chapters, as the tentative program should be ready for publication in the next issue of the Review.

Catherine Worthingham, National Convention Chairman,
San Jose State College, San Jose, California.

Notice to Members-at-large

Letters containing information and instructions have been sent to the chapters. If you wish a copy of this letter kindly drop a card to the secretary, who will be glad to mail you one.

Chapter News

Cleveland

"Your Community Fund Dollar At Work," was the slogan of the exposition held in Cleveland November 13th to 21st, and sponsored by the Committee of the Community Fund Campaign.

The Community Fund supported hospitals were among the exhibitors. A surgery ward (where operations and blood transfusions were performed on dummies), a maternity ward, children's ward, diet kitchen, social service, physical therapy—all the various services a hospital renders, were demonstrated to the public.

The Cleveland Chapter had been requested to be responsible for the physical therapy exhibit. An inductotherm demonstrated on a dummy seemed to attract general attention, but the different ultraviolet lamps, the infrared and the radiant lamps also had their share. Many inquiries were made concerning the paraffin bath. Adults and children paused for a while before the miniature gymnasium and the educational toys, and quite

often the attending physical therapist was called upon to explain the Walkaider.

Serving as attendants, the members of the Chapter were kept busy, and no meeting was held in November. A meeting was called by the Chapter on December seventh. It was decided the Chapter would take three subscriptions to the REVIEW, each to be placed in the three training hospitals in Cleveland, namely, University Hospital, Mt. Sinai, and City General Hospital.

Miss Henrietta McNairy gave a very interesting talk on occupational therapy, bringing out very clearly the connection between physical and occupational therapy.

District of Columbia

Through the courtesy of Mrs. Pyles, in charge of physical therapy at St. Elizabeth Hospital, the December meeting of the Chapter was held in her department. Dr. Eldridge gave a most interesting talk on The Medico-Legal Phases of Physical Therapy. Following the talk, a social hour and refreshments were enjoyed.

Late in November, Dr. O. N. Anderson of the Council on Medical Education and Hospitals of the American Medical Association, inspected the training courses given in physical therapy in this city—Physiotherapy Course at Washington School of Physical Education, and the Physiotherapy Training Course at Walter Reed Hospital.

Minnesota

The Minnesota Chapter meets the first Saturday of each month. Following is a summary of the meetings held to date:

Regular meeting October sixth. Committees for the year were appointed. Various suggestions were considered for the year's study.

Regular meeting October twenty-seventh. Miss Boethke gave her report of the convention at Cleveland. It was suggested that more publicity be given to chapter meetings, and the notices sent to local newspapers. Also suggested that Dr. O'Brien from the University of Minnesota be asked to give a radio talk on physical therapy.

Regular meeting December eighth. It was decided at this meeting that no formal course of study be undertaken this year but that speakers be provided for each chapter meeting, giving something of value to the members.

Southern California

In November, Miss Campbell, former president of the American Physiotherapy Association, paid us a visit while she was here on Association business. A dinner and social meeting was held.

In January, we are to have a meeting devoted to poliomyelitis. Dr. C. M. Hyland will speak on pathology, and Dr. Robert Meals will talk about treatment.

Washington

The Washington Chapter met on the second Thursday in November at the Tacoma Hospital, Dr. Allison of that city gave an interesting paper on poliomyelitis. One of our faithful members, Marguerite Irvine, was not with us for she had recently had an operation.

The December meeting took the form of a Christmas party at the home of Betty Rice. A very jolly evening was spent in games, general fun, and with Santa. Seventeen were present.

ABSTRACTS

John S. Coulter, M. D.

Healing of Fractures

Its Influence on the Choice of Methods of Treatment

Clay Ray Murray, M. D., Assistant Professor of Surgery, College of Physicians and Surgeons, Columbia University; Associate Attending Surgeon, Presbyterian Hospital, New York, in Arch. Surg., 29:3:446, September, 1934.

For the last two decades the problem of bone formation in its various aspects has occupied the attention of many investigators. That phase of the question which deals with the mechanism of healing after fracture has been prominent in the field, and during this time quite new conceptions of the process have been evolved. From the purely academic aspect many points relative to the exact mechanism of the process are disputed. It may be considered that there is no unanimity of opinion on the following questions: (1) whether there exist in the human adult specific bone-forming cells—osteoblasts; (2) whether such cells can be evolved on demand so to speak, by metaplasia of ordinary fibrillar connective tissue cells; (3) whether only certain connective tissue cells are capable of this transformation; (4) whether the cell itself plays any active part of a specific nature in the process; (5) whether there is formed in the process of ossification a specific preosseous substance or matrix, and if so, (6) whether, after it is calcified, it is possible to remove calcium therefrom without coincidentally removing the associated matrix; (7) whether the deposition of calcium in the tissue associated with the formation of bone, be in a preosseous matrix or not, is the result of the activity of an enzyme or independent of it; (8) if an enzyme is involved, whether it is the product of local cellular activity, specific or otherwise, or of focal death of cells, or whether it originates at some point remote from the site of the formation of bone and is brought to the scene of action by the blood stream. The bibliography covers the range of the investigations along these lines and reveals a tremendous diversity of opinion.

On the basis of these observations the process of healing in a fracture is one in which, following the injury and the resultant inflammatory process, an acid PH of the local tissue fluids, dependent on the interrelationship of tissue necrosis and circulatory efficiency, is associated with decalcification of the dead bone at the site of the fracture. Such liberated calcium is held locally by

a chemical adsorption affinity between it and the fibrin of the hematoma and the collagen of the newly formed connective tissue—i. e., granulation tissue—growing from all directions along the fibrin network at the site of the injury, producing a local concentration of calcium about the fracture. With increasing cell metabolism, and with interrelated increasing efficiency of circulation and carrying away of the products of necrosis, there is a reversion of this acid PH to the alkaline side, and coincident with this change there occurs a deposition of the local adsorbed calcium in the newly formed connective tissue to form new bone. Evidence has been listed to support this point of view. If it is correct, methods of treatment can help the healing by aiding, if necessary:

(a) The establishment of the early acid PH in local tissue fluids at the site of the fracture.

(b) The adequate growth of granulation tissue.

(c) The reversion at an early date to a relatively alkaline PH in the local tissue fluids which will allow calcium deposition in the newly formed tissue.

(d) The maintenance of a proper interrelationship between the local metabolic activity and the circulatory efficiency.

There is no difficulty in establishing an early acid Ph. The chief danger lies in such extensive tissue death and relative circulatory inefficiency that this primary state may persist long beyond its useful stage and become a hindrance by subsequently interfering with calcium deposition. It may be considered practically impossible to restore circulatory efficiency and the coincident increased cellular metabolism with removal of products of necrosis so rapidly as to interfere with the adequate operation of tissue fluid PH on the acid side.

Failure of growth of granulation tissue is a frequent cause of inadequate callus. In general, one can say that the restoration of the circulatory status of the part to that approximating normal for the patient as early and as fully as possible should be the aim of treatment designed to influence this factor. The most effective means of doing so is the active use, within pain limits, of the muscular apparatus of the part from the beginning of the treatment. Proportionately as the chosen method departs from this ideal one adversely influences the growth of granulation tissue as well as the biochemical element. Active and painless muscular contraction produced by artificial (electrical stimulation) means is a relatively inefficient substitute. If this is impossible, painless gentle massage (early) may at least relax muscular and vascular spasm sufficiently to improve the local circulation. Absolute immobility of the part as a whole is least apt to aid adequate granulation tissue healing. Moreover, in cases in which the source of granulation tissue is deficient because of the anatomic characteristics of the part, as heretofore described, operative intervention — under proper circumstances as regards organization, personnel, equipment and patient —may be well indicated as the primary procedure, if, as a result of operation, not only good position but also new sources of growth of granulation tissue are obtained and early active muscular activity is made possible by rigidity of fixation at operation. In general, it can be said that healing is slower following operative care in fresh fractures than after closed treatment, except when active motion of the part is possible shortly after operation, assuming, of course, that the operative procedure is or can be so performed so that extensive tissue necrosis and vascular damage are not concomitants. This is a matter for consideration in fractures in the regions referred to previously where the anatomic characteristics of the part are a bar to healing. Incidentally, as a corollary, no operative reduction should be performed under any conditions, except as a matter of necessity, unless the method of operative fixation allows early active function (if necessary through the aid of balanced suspension to relieve strain). External fixation of the part as a whole following operation is, I am convinced, commonly followed by delay in adequate callus formation for the reasons stated. Obviously, also, this has no bearing when operative reduction is a matter of necessity (in interposition of tissue, in inability to reduce otherwise, etc.), the purpose of the operation then being reduction, and it may be impossible to accomplish more than to secure a satisfactory position.

The influence of local collections of fluid on adequate growth of granulation tissue is effective in fractures of the joints through the presence of synovial fluid, and it is not evident how this factor can be obviated. On the other hand, when the accumulated and persistent collection of fluid is free hematoma, early circulatory efficiency aids in diminishing it and can be greatly helped, when the effusion of blood is obviously great, by aspiration. This aspiration should be done early, for when it is delayed the fluid contains a large amount of calcium, which is necessarily removed with it. It is also obvious that violent and repeated attempts at reduction by increasing the amount of necrosis destroy sources of granulation tissue and that operative technic must be of the gentlest and most "tissue economical" type to avoid such a result.

It is also true that, since the interrelationship of necrosis, circulatory efficiency and local cell metabolic activity determines the biochemical status of the local tissue fluids throughout the healing process, the statements made as to the possible bearing of treatment on adequate growth of granulation tissue apply equally to the question of the proper biochemical status of PH in tissue fluids. The use of diathermy in high milliamperage and the practice of frequent or prolonged exposures to roentgen rays may interfere seriously with the healing of fractures. The use of antiseptic solutions of acid reaction in compound fractures interferes with healing. This is often clinically true of the use of surgical solution of chlorinated soda which is not carefully titrated and freshly made, which is frequently accompanied by actual decalcification of bone and slow healing. Lastly, the administration or use of agents designed to affect the general body metabolism or to affect specifically the calcium and phosphorus metabolism is without appreciable value in the treatment of fractures.

Foot Pain

John Fraser, M. C., M. D., Ch. M., F. R. C. S. E., Honorary Surgeon to H. M. the King in Scotland; Regius Professor of Clinical Surgery, University of Edinburgh, in Practitioner, XXIII:3:304, September, 1934.

Pain in the Heel

In investigating a complaint of pain in the heel the examiner should begin by attempting to localize the point at which the maximum pain is complained of, whether it is induced by pressure or as a subjective symptom. Speaking generally heel pain is localized to one or other of three points—the posterior aspect, the under surface, or as a more central manifestation, in which case it is referred to the medial and lateral sur-

faces of the bone. It is likely that each of these possibilities has an independent explanation. When pain is complained of in the posterior aspect of the heel there may be various reasons for its appearance.

In all probability in cases of this kind there is some underlying factor of a general nature which is not fully understood, something of a toxic nature, or it may be an irritation of a growth disturbance type. When the diagnosis is established, treatment is adopted; which implies a sufficiency of rest, the avoidance of pressure on the tender part, and the application of a counter-irritant or of diathermy.

The third variety of posterior heel-pain is often encountered among army recruits. The army boot is an extremely strong article, reinforced at the heels by a special inlet, which is apt to wrinkle unless it is nourished by a plentiful supply of dubbin. Long hours of standing and marching in such foot-wear are apt to result in a most troublesome type of posterior heel-pain, a teno-synovitis of the calcanean tendon. The problem of treatment resolves itself into the relief of unreasonable pressure—the wearing of a felt pad to protect the tender area from the friction of the boot, the application of such a counter-irritant as equal parts of tincture of belladonna and tincture of iodine, and the elimination of any toxic focus which may be exerting a general influence.

Pain on the under surface of the heel originates in the periosteum or in the fibrous attachments of the muscles and fasciae. It is particularly liable to affect those who suffer from rheumatism or from osteo-arthritis, or who in the past have been the victims of urethritis. Its origin probably lies in a split in the periosteum caused by the pull of the plantar fascia and sole muscles, and through the gap bone-forming elements escape and result in the deposit of minute osteophytic outgrowths. The changes are generally evident on x-ray examination, but in the early stages of the error and ossification may not be sufficiently complete to be radiologically visible.

In considering the question of treatment one is often inclined to advise operation and removal of the spurs, but experience has shown that such interference is disappointing, for there is a tendency to early recurrence in a more pronounced degree than formerly existed. It is generally sufficient to protect the part from pressure in the knowledge that in time the outgrowth will disappear spontaneously. The procedure which affords the greatest measure of relief is the wearing of sponge rubber or felt soles, in which nest depressions have been cut opposite the painful areas, so that there is a minimum of pressure upon the tender points.

When pain is referred to the side of the heel bone it usually signifies that there is some central disturbance at fault, as, for example, tuberculosis or chronic osteomyelitis.

Tarsal Pain

Pain referred to the centre of the long axis of the foot, and more particularly to the region of the mid-tarsal joint is a common experience. The symptom is encountered in several conditions, of which the more important are tarsal scaphoiditis (Kohler's disease), chronic infective osteomyelitis, tuberculous osteomyelitis, joint strain associated with plantar flat-foot, and arthritis of the atrophic type.

When a child complains of pain over the medial border of the tarsus the possibility of tarsal scaphoiditis should be borne in mind. The pain is induced by standing or walking, it is described as more of an ache than a definite pain, and it is often reflected in the muscles of the leg.

Chronic osteomyelitis of the tarsal bones, whether pyogenic or tuberculous, begins as a central process in the medulla of the bones.

When tarsal pain arises in association with plantar flat-foot the feature is evidenced on the under surface of the medial border of the foot. The site corresponds to the inferior calcaneo-scaphoid ligament, and at this point there may be swelling with local tenderness. The condition is one of ligamentous strain exaggerated by pressure of the head of the talus, the bone being rotated downwards on its cross axis as the result of the flat-foot. It is characteristically seen in that variety of subacute flat-foot which appears when a patient begins to walk after a period of prolonged rest in bed. In the ordinary static flat-foot it is not so evident, because the parts have an opportunity of becoming accommodated in a gradual fashion to the variations of tissue change. The condition is easily relieved by such simple measures as rest, bathing the feet in hot water, massage, and the provision of some measure of artificial support to the fallen arch.

Chronic anthritis of the inter-tarsal joints is one of the most intractable causes of tarsal pain. For the reason that it principally affects the maximum weight-bearing area of the mid-tarsal joint it is referred over the dorsum of the foot and towards the base of the fifth metatarsal bone.

Metatarsal Pain

In the static group anterior or metatarsal flat-foot is the commonest and most important. As a result of the modern fashion of wearing high heels the anterior portion of the metatarsal area is called upon to bear an undue proportion of the weight which normally should be distributed among the three weight-bearing parts of the foot, so that there is an undue degree of strain upon that portion of the ligamentous arrangements which connect the necks of the metatarsal bones with one another.

In the treatment of cases of this type the ideal aimed at is to restore the displaced bones and to maintain them as far as possible in a normal position. Various means have been suggested to secure this end: it is often possible to correct the displacement by the use of circular metatarsal bands of the Goldthwait or Johnson pattern applied immediately behind the metatarsal heads; in other instances a pad of felt or sponge rubber placed slightly proximal to the prominent heads of the bones may prove sufficient. If for any reason these means cannot be employed, the patient may obtain relief from pain by wearing on the under surface of the boot sole a metatarsal bar of leather measuring half an inch in width and a quarter of an inch in thickness, the bar being adjusted so that its anterior border lies immediately behind the tread of the sole.

Metatarsal pain of a traumatic origin arises in relation to the distal ends of the second and third metatarsal bones. If these parts are examined by radiogram or as actual tissue, it will be found that the portion of the shafts which approximates to the heads—the necks of the bones in fact—is remarkably thin and fragile in contrast to similar parts in adjacent bones; it is not surprising therefore that under certain conditions they are the site of lesions which, while traumatic in character, may not at first sight appear to have direct association with local injury.

The most remarkable example of the case with which bone injury can occur in this situation is found

in the condition known as march fracture, in which, as the result of prolonged strain in walking, the bone breaks in a manner which may well be described as spontaneous.

Sometimes pain is complained of over the base of the fifth metatarsal bone, and when the part is x-rayed it is found that there is a fracture, complete or partial, through the tip of the oblique proximal end of the bone.

The Treatment of Lupus Vulgaris

Svend Lomholt, M. D., Director of Dermatological Clinic, Finsen Light Institute, Copenhagen, in British M. J., No. 3841, Aug. 18, 1934, page 291.

Our principal treatment consists in local Finsen treatment with concentrated carbon arc light, supplemental with carbon arc light baths. It is a very rare event for a case of lupus to be of so malignant a nature that it is not improved by our light therapy. During thirteen years' experience in the Finsen Institute, Copenhagen, the writer has seen only two such cases. Both were in children; the disease began in the nose and spread steadily in spite of thorough treatment. Lately, however, a new form of light treatment has been introduced, and it seems to be able to check the disease even in these two cases. Generally, lupus is very amenable to Finsen light treatment, recovery being obtained in the great majority of cases, and a considerable improvement in the remainder. In early cases with small lesions the percentage of recovery is practically one hundred. Consequently all efforts must be made to bring the patients under light treatment early in the disease, especially as a temporary symptomatic treatment (corrosives, cauterization, etc.), such as is often given by physicians anxious to render immediate help, may make light treatment difficult because the scars formed hinder the penetration of light.

To ensure that patients come early under the Finsen light method of treatment it is essential to provide sufficient adequately equipped hospitals for such treatment. In Denmark, with its three million inhabitants, the Finsen Light Institute has been found to afford ample accommodation. It has for this special purpose about fifty beds, twelve lamps of the Finsen-Lomholt type, and a similar number of carbon arc light baths—that is, six light baths for the daily treatment of about sixty patients for one hour each. The Institute can receive nearly all the fresh cases of lupus referred to it, can carry on the treatment to relative recovery, and can also manage the treatment of a not inconsiderable number of older patients whose earlier treatment has not resulted in complete recovery. We have been able to cure several of these latter patients as well, and in the rest we have obtained a definite improvement.

General Treatment

Dietetic Measures.—In recent years, particularly in Germany, extensive experiments have been made with certain forms of diet (Gerson, Hermannsdorffer-Sauerbruck) which contain a large amount of vitamins and fresh vegetables, and practically no sodium chloride at all. Some authors have reported very good symptomatic results from this treatment, although real cure appears to be considerably less frequent. The results reported by other authors have been more modest.

In the Finsen Institute, experimental treatment with this diet was given to forty patients, but without any noticeable effect. When the patients themselves were asked what was their personal impression only one replied that he had noticed any considerable improvement.

Light Baths.—Finsen was the first to observe that sun baths had an excellent effect on surgical tuberculosis. Unfortunately, the climate in Denmark does not permit of an extensive treatment with sun baths, but the idea rapidly gained ground in other countries, especially in Switzerland (Bernhard, Rollier), where it gave excellent results. Later Reyn introduced a similar treatment with artificial light: the Finsen carbon arc light bath, given as a supplement to the classical local Finsen treatment of lupus with concentrated carbon arc light. By this the therapeutic results in the Finsen Institute were improved considerably, and this combination of local and universal light treatment still remains the routine treatment in our Institute. It is our experience that the carbon arc light has a much stronger effect on lupus vulgaris than the mercury lamp. In recent years we have commenced to introduce a new type of lamp, the "universal lamp" in which the pure carbons are replaced by Siemen's Schneeweisskohlen ("white flame carbons"), which give an emission resembling sunlight considerably more closely than does the emission from pure carbons. The carbons are placed almost parallel, so that the emission from both craters is utilized when the patients are irradiated in a horizontal position with the lamp suspended above them. With this lamp we obtain a much stronger erythema effect than previously, and the same, or even a better therapeutic effect with a shorter time of exposure. Of course, it is difficult to furnish any statistical proof of this, but several patients in whom the improvement seemed to have stopped under the original carbon arc light treatment made new progress with the new light baths. This was the case with the two before-mentioned cases which, as stated, proved refractory to the original treatment with the Finsen light bath.

The light baths are to be given to the patients lying down, daily or every other day, in such initial doses as will produce a moderate erythema. The time of exposure is increased gradually from day to day, up to one hour as a maximum, care being taken to avoid a strong erythema uncomfortable to the patient. In case of strong irritation it is advisable to make a short pause, and then begin anew with a smaller dose. The treatment should not be continued uninterruptedly for more than three months at the most, after which period there should be a pause for about one month.

Local Treatment

Surgical Removal.—Excision is the most sure and, if successful, the simplest method. It may be employed for very small lupus lesions on the face—though not very well where a lesion is located on the nose—and on the hands, and against most lupus processes on the trunk and extremities. The excision must also include a surrounding zone of definitely normal tissue.

Electrocoagulation.—In recent years this treatment has been largely recommended, especially by German authors. It has the advantage that the risk of recurrence is less than with a simple excision. The treatment may be carried out either by compact destruction of the entire area involved—the method of choice with all small lesions—or by regular excision with a knife-shaped electrode or a bent band-shaped electrode as recommended by Wucherpfennig (Uber das elektrische Schneiden mit der Drahtschlinge, Jena, 1932). The open wounds are allowed to fill in by granulation, or their edges are pulled together with sutures. This

method is quick and radical, and often gives good results, but it must be clear that it is not an ideal method as it often produces disfiguring scars.

Scarification. — This form of treatment has been recommended, especially by French authors. We have had no personal experience with this method in our Institute, but it does not appear to be very effective.

Chemical Corrosion.—Corrosive treatment is able to remove the main part of lupus tissue, even in large plaques, but complete recovery is rare. After some time new nodules make their appearance in the zone around the scar and in the scar itself. Further, the scar is apt to undergo hyperthropy and become rather disfiguring. A serious drawback to the corrosive treatment is that the massive scar tissue makes subsequent light treatment very difficult.

Local Light Treatment.—There are two methods for local light treatment. The Finsen treatment with concentrated carbon arc light, and the Kromayer treatment with water-cooled mercury vapor light. The latter method of treatment is by far the easier and less expensive, but it is the general consensus of opinion that it is considerably inferior to the Finsen treatment, and therefore, it ought to be employed only where Finsen treatment is not available.

For Finsen treatment, as carried out at the Finsen Institute, we now use exclusively our new model of the Finsen-Lomholt lamp, which has the advantage of being worked automatically, so that one nurse can operate three lamps at a time. This lamp also, is considerably more effective than the original model. Its main points are described in the British Journal of Dermatology, 1930:

A carbon arc lamp of 20 to 30 amperes, with automatic regulation and with the positive upper carbon in the horizontal and the negative carbon in the vertical position.

A concentration apparatus consisting of (1) a strong plano-convex front lens (focus distance about 10 cm.); (2) a large quartz cylinder, the ends of which are formed by two plano-convex lenses melted into the walls of the cylinder, the cylinder being filled with a watery solution of cobalt sulphate (red); and (3) a cuvette filled with a blue solution of copper sulphate in strong ammonia, a strong plano-convex quartz lens forming the front side of the cuvette.

A number of quartz tubes of different shapes, to be used for the compression of the lupus patches during the treatment.

By using lenses of thermo-resistant quartz (fused instead of natural silica) it is practicable to place the luminous positive crater close to the concentration apparatus, and the use of colored filters makes it possible at the same time to filter off the inactive luminous rays. By this the concentration of the ultraviolet rays is increased to four or five times the concentration obtained with the original apparatus, so that the irradiation time may be reduced to about one-third of the time formerly required.

The treatment must be given in an orderly manner, beginning at one side of the lesion and proceeding systematically until the whole plaque is treated completely. The physician in charge must follow the treatment from day to day, and direct what parts are to be treated and in what succession; he must watch especially that one application joins another closely, so that no diseased tissue is missed.

In lupus of recent development our rule is always to give five to seven series of irradiation with an interval of eight to fourteen days as first treatment. Each series consists of a number of exposures lasting one hour and covering an area the size of, say, a shilling, until the whole patch has been irradiated.

It cannot be emphasized strongly enough how important it is to complete the treatment the first time.

Conclusion

According to the scheme outlined above we have treated about one hundred and fifty fresh cases of lupus vulgaris in the Finsen Institute, Copenhagen, during the last two years. Apart from a few extensive inveterate cases in patients who could not afford sufficient time for proper treatment, we have obtained apparent cure in nearly eighty per cent—that is, all nodules and other symptoms of activity disappeared and the scars remained free from relapses. In the rest of the cases great improvement was obtained. Only a few scattered nodules reappeared in a scar otherwise free from lupus.

Disturbances of the Body Temperature

C. E. Lakin, M. D., F. R. C. P., Lond., F. R. C. S. Eng., Physician to the Middlesex Hospital and the London Fever Hospital, in Lancet, CCXXVII: 5792:467, Sept. 1, 1934.

The means at our disposal for registering the temperature of the body are:

(1) The mercury thermometer—either in the form of the clinical thermometer as we now know it or, where surface temperature is being investigated, a mercurial thermometer of special shape in which a long cylindrical bulb coiled up in one plane at right angles to the stem is applied to the skin.

(2) The electrical resistance thermometer. This method depends upon the alteration of the electrical resistance of a platinum wire caused by a slight increase in its temperature. The alteration in conductivity is then measured by means of a Wheatstone's bridge or may be recorded photographically.

(3) The thermopile. This is based upon the principle that if the junction between two dissimilar metals be warmed a difference of electrical potential is produced and a potentiometer is used to record the current changes.

Normal Daily Range of Temperature

The mean daily temperature in health is usually said to be 98.4° F. when taken in the mouth. If the whole twenty-four hours be taken into account this is probably rather too high than too low a mean.

Pyrexia: Hyperthermia: Aseptic Fever

Before proceeding further it may be well to define the sense in which the words pyrexia, hyperthermia, and fever are used in these lectures. Pyrexia is used in the sense of a heightened body temperature. Hyperthermia signifies a high temperature produced by causes other than infection, such as, for instances, is seen in heat-stroke or pontine hemorrhage, or after the injection of drugs such as B-tetrahydronaphthylamine. The last example will in due course be considered under the heading of aseptic fever. The term fever is used in the sense of a complex response of the body to infection in which pyrexia or raised temperature is but one of the manifestations. It is essentially a response in metabolism associated with a toxic disturbance of heat regulation, and it will be shown to be due to an exaggeration of the processes by which the body normally responds to conditions which otherwise tend to lower the body temperature. Before entering upon a consideration of the

underlying processes responsible for fever it will be convenient to give some attention to the subject of hyperthermia such as is exemplified in heat-stroke.

Disturbances of the Body Temperature

C. E. Lakin, M. D., F. R. C. P., Lond., F. R. C. S., Eng., Physician to the Middlesex Hospital and the London Fever Hospital. In Lancet CCXXVII: 5793:526, Sept. 8, 1934.

Heat Regulating Centers in the Brain

Recent investigations suggest that it is situated in the hypothalmic region and most probably in the tuber cinereum. Careful removal of the corpus striatum has produced no loss of temperature regulation (Samson Wright: "Applied Physiology," 1931, p. 87). Puncture of the tuber cinereum has given rise to a sudden increase in the respiratory rate and often extreme pyrexia—occasionally 109 F.—has been recorded. In many instances glycosuria has occurred, polyuria setting in very regularly within one to three days from the time the puncture was performed. From the fact that Barbour had to employ water several degrees above or below that of the body, it has been argued that the site concerned with heat regulation must be situated some distance away from the corpus striatum where the tubes were applied and in the light of what has just been said this site might well be the tuber cinereum. I doubt in the present state of our knowledge if more can be said. Cramer, whose views on the causation of pyrexia we shall notice more fully presently, regards heat regulation as a function of the sympathetic nervous system controlled by the thyroid-adrenal apparatus, and points out that the so-called heat center in the tuber cinereum is explicable as a group of nerve cells representing the central connections of the sympathetic system.

Chemistry of the Febrile State

The chemical reactions of the body, like those occurring in a test tube, are speeded up by a rise of temperature. It has been calculated that a patient with a temperature of 105 F., would manifest an increase of fifty per cent in his metabolism and in his pulmonary ventilation because of the pyrexia alone. The enormous destruction of protein that occurs is shown not only by the increased output of urea, creatinine, and purine bodies in the urine, but also by the wasting and loss of weight that occurs in any prolonged fever. The output of phosphorus and sulphur is also increased for the same reason. The urea may be increased two- or three-fold in the urine. In typhoid fever this increased output of nitrogenous bodies may represent a loss of four or five pounds of muscle in a week.

Loss of weight, however, is not solely to be attributed to destruction of the proteins of the body. Doubtless, loss of appetite and diminished intake of food play their part. In this connection it is interesting to note that free hydrochloric acid is usually absent from the gastric juice if a fractional test meal is carried out. The glycogen in the liver and muscles rapidly become exhausted. Fats are also destroyed though in lesser degree than proteins, and in the presence of a comparative poverty of carbohydrate some degree of acidosis is often met with. Acetone is frequently to be found in the urine. The rapid respiration characteristic of fever serves to reduce acidosis by eliminating more carbon dioxide through the lungs. The presence of acetone bodies in the urine of febrile patients does not exclude the existence of an alkalosis. Alkalosis is most likely to be met with in pyrexia associated with pulmonary lesions in which the oxygenation of the blood is effected with difficulty and in which hyperpnoea results.

At the onset of fever and during the stage of rigor there is often increased diuresis due to the increased blood pressure, and copious diuresis often occurs as the temperature falls at the end of a febrile attack. During the height of a fever urine is diminished in amount, becoming concentrated and highly colored. Urobilin may be present in considerable quantity, apparently resulting from increased destruction of hemoglobin and in consequence some degree of anaemia is the rule. The urinary chlorides are diminished in all fevers excepting malaria, and the reason for their retention is not understood. It is quite different from the chloride retention of nephritis, for in nephritis the blood chlorides are high, whereas in fever they are low. They must therefore be retained in the tissues. Water retention also occurs; possibly this is to be correlated with the retention of chlorides in the body and the diminished excretion of urine. The diminution of the urinary chlorides is exemplified particularly in the case of pneumonia.

Other Responses

In some fevers the skin is dry and burning to the touch, the sweat glands being apparently paralyzed by toxins. Pneumonia and scarlet fever are obvious instances. The sweating met with in acute rheumatism and acute pulmonary tuberculosis proves a notable exception to the general rule. The rate of the heart is increased and at the onset of a febrile illness when the arterioles of the skin are contracted the blood pressure is usually raised; later, when the blood vessels dilate and the heart is beating less powerfully, the blood pressure falls and the pulse becomes dicrotic, a phenomenon which is particularly well seen in cases of typhoid fever. We have seen that the respirations are increased in rate and there is an increase of CO_2 in the expired air on account of the great increase in metabolism which is occurring. The disturbance of the nervous system is shown by restlessness, depression, and, in more severe cases, by delirium, tremor, and subsultus tendinum.

Is Fever Beneficial or Not?

The question whether fever is beneficial or not can hardly be answered satisfactorily in the present state of knowledge. We have only to recall the seriousness of these infections in old and enfeebled subjects when unattended by any appreciable rise of temperature to assert that its absence is to be feared. It would appear then that the body is able to deal more effectively with the invading organism when the temperature is raised, and to this extent pyrexia is to be regarded as a defensive mechanism. A very high temperature, 107 or 108 F., is certainly harmful and, if continued, will result in death from injury to the nerve cells. But there is no ground for believing that a moderate degree of fever is detrimental, and it is not necessary to attack it with antipyretic drugs. The bounding pulse of fever is evidence of the increased energy of the circulation and it is largely by the blood stream that protective substances are carried to every part of the body. In the case of infected animals it has been shown that agglutinins and bacteriolysins are produced more quickly and in larger quantities if the animals are kept at a moderate elevation of temperature than in control animals kept at ordinary temperatures, but, as R. T. Hewlett points out, very high temperatures inhibit these immune reactions. It is well known that high temperatures inhibit the growth of bacteria, but it is only in severe fevers that body temperature could have any definite influence in this direction, and such an argument is unconvincing. Temperatures high enough to produce such effects would induce cloudy swelling of the parenchymatous cells of the body.

Disturbances of the Body Temperature

C. E. Lakin, M. D., F. R. C. P., Lond., F. R. C. S., Eng. Physician to the Middlesex Hospital and the London Fever Hospital, in Lancet, CCXXVII: 5794:586, Sept. 15, 1934.

The Therapeutic Reduction of Pyrexia

The treatment of a febrile disorder will, of course, differ according to the cause, but it is sometimes necessary to take measures to control the attendant pyrexia. In any lengthy fever this is most efficiently carried out by the application in some form or another of cold. Currie of Liverpool in 1787 first recommended the cold bath treatment, but it was soon forgotten. Its reintroduction is due to Brand of Stettin in 1861. My old chief, William Cayley, was the first physician in England to introduce the cold bath in the treatment of typhoid fever and through his able advocacy its use in a more or less modified form soon became general. Prior to its introduction the so-called typhoid state was the usual accompaniment of a continued fever, in spite of treatment by various antipyretic remedies and by enormous doses of alcohol. It was found that the cold bath was followed by slowing of the pulse and by an increase in its tension, by slowing of the respiration, and improvement in the appetite. Under its use the tongue became moist, delirium disappeared, and sleep was restored to the sufferer. Statistics soon showed that by its adoption the mortality of the disease was lessened.

Effects of Cold on the Body

Exposure to temperatures below 6° C. (about 21° F.) produces destruction of the tissues due directly to the cold. This is probably to be ascribed to some physical change which destroys absolutely the protoplasm of the cells. But here we are concerned only with the general consequences of cold on the body. Its first effect is to contract the musculature of the arterioles of the skin and blood is driven back into the interior of the body. The temperature sinks, metabolism is slowed in all organs, and their activity is consequently reduced. The limbs become weak and stiff and an irresistible desire to sleep is experienced. Just as pyrexia is attended by wakefulness, cold shows its counterpart in somnolence. Possibly the sleep centre which is in close juxtaposition to the heat centre in the hypothalamus is concerned in bringing about this result. Respirations are slow and shallow and the pulse becomes small and weak. If the body temperature continues to fall till 18° to 20° C. (64°-68° F.) is reached the heart stops beating and death supervenes. A perfused heart, beating well upon Ringer's fluid, slows down and stops if the fluid is cooled to 18° C. Such a heart will start beating again if the fluid be warmed, but the resuscitation on the human body is a different matter. Nothing distinctive is found on post-mortem examination and death appears to be due to the gradual slowing down of metabolic processes.

Algidity

This is a valuable term which has lapsed from general currency. It was used by a former generation of physicians, particularly by Byrom Bramwell, to indicate states of general depression of the body temperature. It occurs both as an acute and as a chronic state. General algidity must be distinguished from the condition in which the temperature of the peripheral parts is lowered while that of the central or deeper parts remains normal or is elevated—a condition which may be termed peripheral depression of temperature or peripheral algidity.

Peripheral depression with a normal temperature of the central and deeper parts is common in disease; while peripheral depression with central elevation is of frequent occurrence in febrile disorders. During the stage of rigor, for example, the rectal temperature may be rising rapidly and very much above the normal, while the patient is shivering with cold and the temperature of the peripheral parts subnormal. In cholera, too, the surface temperature may be greatly depressed while the central (rectal) temperature is normal or much above normal. In some cases of sclerema neonatorum remarkable differences have also been noted between the peripheral and central temperatures. Many other examples of a similar kind might also be mentioned.

Acute general algidity, that is to say an abrupt depression of the body temperature, is seen in prolonged exposure to severe cold. Recovery has been reported in persons who have missed their way on mountain paths and have been found with temperatures in the neighborhood of 78.5° F. A drunken man is especially liable to experience a marked fall of temperature if exposed to cold or inclement atmospheric conditions on account of the dilatation of the skin vessels produced by alcohol.

Chronic general depression of temperature is seen in myxedema, chronic uremia, catarrhal jaundice, and in some melancholic forms of insanity. In cancer of the stomach the temperature is not infrequently 1°-2° below normal, the depression being due to inanition rather than to the pathological character of the lesion. In many cases of chronic cardiac disease associated with cyanosis a subnormal temperature is seen.

Spinal Manipulation with Special Reference to Lumbosacral Strain and Brachial Neuritis

Thomas Marlin, M. D., Glasg., D. P. H., D. M. R. E., Medical Officer in Charge of the Massage, Light, and Electrotherapeutic Departments of University College Hospital, in Lancet, CCXXVII:5792:477, Sept. 1, 1934.

In a study of the methods commonly used for manipulating the spine, whether it be by the "osteopath's twist" or by the forcible movements under an anesthetic as practised by orthopedic surgeons, one cannot help feeling that generally an unnecessary amount of force is used.

A strong couch is required, suitably padded, and with detachable pillow, so that the patient can lie quite flat. It is essential to have the covering of the couch of some material other than leather, and for this purpose a corduroy cloth is recommended, so that the friction between the patient and the couch will be minimized.

The patient lies on his face, head turned to either side, and grasps the two top corners or legs of the couch, while the operator at the foot of the couch takes hold of the ankles. An assistant bends over the patient with his hands on either side of the spine, and exerts a considerable pressure vertically downwards on the patient's back at any desired level. The first operator, raising the patient's feet, legs, and part of his body off the couch, gives a steady pull, and if necessary augments this with a tug. Success of this team manipulation depends on the cooperation between the two operators, and though one of them is designated the assistant, this is for purposes of description. The assistant may nod or use some prearranged signal to show that he is making his pressure, and the operator at the feet, who meanwhile has been awaiting the signal, pulls at exactly the correct instant. The assistant indicates whether the desired movement has taken place, then another attempt may be made if necessary, or a tug administered. If the assistant's pressure is made at the level of the fifth dorsal vertebra, then the spine from that vertebra up-

wards will be fixed, so that the movement will tend to be at the articulations between the fifth and sixth dorsals. By suitably altering his hands the movement can be directed to the lumbo-sacral, or any other level as the assistant wishes.

Certain points should be noted. In this method of manipulation no loud snap takes place. There may be a soft noise, not easily heard, so the operator pulling on the ankles is generally not aware whether he has produced movement. The movement, in fact, is only slight, and only detected when the assistant is carefully watching for it. He must keep a very steady pressure and not allow his hands to slip over the patient's skin while his fellow worker makes the pull; hence it is practically impossible to carry out this treatment over a silk garment, for this slips readily under the fingers.

Another point is that in most cases only slight traction on the ankles is sufficient. The movement seems to take place almost before we are ready to appreciate it. If that is so without having the patient anaesthetised, then is it not possible that many people suffer injury to their spines as they lie stretched out completely relaxed under deep anaesthesia on the operating table, and even if they get over that ordeal, are they always treated with due respect as they are hoisted from table to trolley and from trolley to bed by people who do not realize the delicate task they are performing?

Brachial Neuritis

The important thing which may be overlooked is the part played by the first rib. It is not uncommon when palpating in the supraclavicular region to find the first rib sensitive and slightly more prominent than its fellow, as if pulled up on the affected side. Perhaps such a condition could be initiated by such an act as sneezing, when, owing to the peculiar attachment of the scaleni muscles, the first rib might be drawn up and cause interference with part of the brachial plexus. Accordingly, treatment should be directed to freeing-up the first rib, and this, as was pointed out, has always been one of the difficult problems.

A single operator, trying to manipulate, say, the first left rib, might proceed in the following manner. The patient lies on his face, no pillow, head turned to the left, and arms hanging down over the edge of the couch. The operator, standing on the right side, places the heel of his left hand against the angle of the rib under consideration, then with his right hand he grasps the patient's chin and rotates it as far as possible to the left and holds it in that position. With his left hand he now delivers a downward thrust—i. e., in a postero-anterior direction—against the angle of the rib, and this sometimes gives the desired movement. This thrust is not at all pleasant to the patient, and in rough hands a great deal of pain may be inflicted without producing any beneficial result. The team technique, however, overcomes all this discomfort. The operator, taking his hold as above, draws the chin to the limit of rotation, and makes a steady pressure over the first rib, but avoids making any thrust. Then the assistant, also standing on the right side, grasps the patient round the thighs. When the trunk is raised to a particular height a distinct movement of the rib will probably be felt, without any discomfort to the patient.

When this has been done strapping should be applied for a few days to take the weight of the arm off the shoulder. Naturally, other factors such as septic foci or dietetic errors would be sought for and corrected, but the intention of this article has been to draw attention to, and describe, a part of the treatment which is not generally understood—namely, the production of those movements which have been mentioned.

The Treatment of Pain in Lumbago and Sciatica

F. G. Thomson, M. A., M. D., F. R. C. P., Consulting Physician, Royal Mineral Water Hospital, Bath., in Practitioner, CXXXIII:3:274, September, 1934.

General Treatment

In general terms fibrositis, whether resulting in lumbago, sciatica or other local manifestations, expresses the reaction of fibrous tissue to microbic infection or metabolic toxins. Hence the necessity of removing any obvious source of infection, such as diseased teeth or septic tonsils, and correcting, so far as possible, any metabolic errors, more particularly those associated with gout. Intestinal disorders may constitute an important etiological factor, and it is not uncommon for an incipient attack of either lumbago or sciatica to be rapidly relieved by a suitable aperient. In the early stages of attack of either of these painful affections, calomel, caster oil and colchicum are well worth bearing in mind.

Rest in the acute stage is of paramount importance. In lumbago the pain, when the patient is lying at rest with muscles relaxed, is not usually of great severity. The slightest movement, however, which entails contraction of the erector spinae or gluteal muscles causes dragging on the inflamed fasciae with intense pain. At this stage the patient is only too willing to remain at rest, but when the acute phase is subsiding it is important to bear in mind that premature activity may cause a return of pain in all its original severity.

Drug treatment.—The number of analgesic drugs available is legion, and every practitioner probably has his favorite preparations.

Local Applications

Lumbago.—Any stimulating liniment which produces dilatation of superficial vessels tends to relieve pain by causing a corresponding dilatation of deeper vessels with freer circulation and diminution of tension in the painful area.

Sciatica.—Local applications of liniments are of very doubtful value.

Local Injections

Lumbago.—In cases of lumbago, in which the pain appears to originate in well defined tender nodules, the injection of a few drops of absolute alcohol round or into the nodules themselves often relieves pain quicker than anything else. Quinine-urea may be injected for the same purpose, but gives much less certain results. In less acute cases I have sometimes found that injections of thiosinamine comp. (Martindale) ½-c. cm. injected at two or three day intervals affords considerable relief.

Sciatica.—In suitable cases the injection of normal saline solution into the trunk of the nerve may cut short the attack in a way that no other treatment will do. The cases suitable for this kind of treatment are those in which the inflammation affects the sheath of the nerve trunk. In cases of root-sciatica it is not of any value.

Spa Treatment

In the early acute stages spa treatment is not advisable either for lumbago or sciatica. The patient will do better to stay in bed and rest at home. This applies especially to sciatica in which premature movement is apt to bring back the pain in all its original intensity. In the later stages of either, spa treatment in one form or another is admirably suited to hasten complete recovery. The aims of spa treatment are two. First, the elimination of microbic or metabolic toxins by the ju-

dicious use of aperient or diuretic waters, combined with warm baths and hot packs to induce perspiration, and, secondly, the resolution and removal of inflammatory thickening of fibrous tissue, and relaxation of muscular spasm, by local application of douches, mudpacks, radiant heat, diathermy, massage and so forth.

Local Treatment

The forms of local treatment commonly applied for lumbago are: (1) Heat; (2) Mud-packs; (3) Ionization and diathermy; (4) Light treatment; (5) Massage.

Heat.—The local application of heat by means of hot bottles, fomentations, radiant-heat lamps, or the electric pad gives much relief both in lumbago and sciatica. The last named, when available, has the advantage that it can be maintained at a uniform temperature, and applied for long periods of time without disturbing the patient.

Mud-packs.—These relieve pain by acting as conveyors of heat. Ionization and diathermy produce a similar effect, probably by acting as counter-irritants in addition to any specific action they may exert.

Light therapy.—During the last few years light treatment has embraced not only the visible rays of the spectrum but also the ultra-violet rays on one side of it, and infra-red rays on the other. So far as treatment of lumbago is concerned, ultra-violet rays appear to have very little value, and it is very doubtful if the infra-red rays are more effective in relieving pain than radiant heat. The latter applied by means of the arc lamp or some similar device is specially useful in conjunction with diathermy or the massage douche.

Massage.—Though it can hardly be considered as a means of relieving pain at the moment, and may in fact be distinctly painful in itself, massage is probably the most valuable means we possess to prevent further attacks, by breaking down the scar tissue which results from fibrositis. To ensure success, however, the operator should have special knowledge and training for this kind of work, to enable him to detect and treat the areas particularly affected.

Local treatment of sciatica.—Generally speaking, it may be said that, apart from the application of heat in one form or another, the local treatment of sciatica is less valuable than it is in lumbago, and furthermore it must be applied with much greater caution. The premature or injudicious application of powerful douches, ionization, diathermy or deep massage will be almost certain to retard the patient's recovery by increasing the amount of pain. The trouble with most patients coming to a spa for the treatment of sciatica is that they are anxious to crowd in as much treatment as they can to get the business over and return to work or whatever occupation they usually indulge in.

The Effect of Prolonged Hard Muscular Work on Sulphur and Nitrogen Metabolism

By Harry Ellis Charter Wilson (From the Institute of Physiology, University of Glasgow), in J. Physiol. 82:2:184, September 19, 1934.

The influence of muscle work on the metabolism of protein has already been comprehensively reviewed by Cathcart (1925), and tentative hypotheses of the changes observed have been made by Cathcart and Burnett (1926), and Wilson (1932), in the light of recent work. During the autumn of last year I had the opportunity of making a further series of observations on this problem. These were carried out on a long-distance racing cyclist who, at intervals of about a week, rode a bicycle ergometer for a continuous period of over eight hours. This paper records the results of these experiments.

In general the results fall into line with those of the literature cited above, indicating:

(1) That there is an increase in N and S in the urine during and following a period of work.

(2) That the increase in N excretion bears no relation to the amount of work performed.

(3) That the increase in N excretion tends to be greater the higher the protein intake.

Further, although the data failed to shed more light on the exact significance of the increase in N output, they would appear to discountenance any suggestion that an increase in the wear and tear of muscle tissue is involved.

The Radiation of Heat from the Human Body. IV. The Emission, Reflection and Transmission of Infra-red Radiation by the Human Skin

James D. Hardy and Carl Muschenheim (From the Russell Sage Institute of Pathology in Affiliation with the New York Hospital, New York) in J. Clin. Investigation, XIII:5:817, September, 1934.

Although the absorption and reflection by skin of ultra-violet and visible radiation has been studied extensively, beginning with the spectrographic observations of Hasselbalch (1) in 1911, there has been relatively little investigation of these properties of the skin in respect to the infra-red region of the spectrum. This is especially true of the spectroscopic study of the skin in relation to infra-red radiation, as most of the investigations reported in the literature have been carried out by means of filters.

Our interest in the long wave length reflecting and transmitting powers of the skin lies in the relation of this form of radiation to the heat regulating mechanisms of the body. As is well known, the heat produced by the human body is dissipated to the environment by evaporation, conduction, convection, and by radiation. Much evidence has accumulated in the course of studies of skin temperature (Aldrich (2), Cobet and Bramigk (3), Hardy (4), not only that the radiation loss occurs entirely within the infra-red region of the spectrum, as would be expected, but that within the range of effective radiation the skin obeys the laws of black-body emission. As a consequence, one would expect to find no reflection and, conversely, complete absorption of radiant energy within this range of the spectrum by the outermost layers of the skin, since the radiating character of a body depends on the nature of its surface.

The following experiments fall into three groups: (1) Experiments on the emission spectrum of the skin compared to the emission spectrum of an experimental black-body. (2) Experiments on the infra-red reflection spectrum of skin. (3) Experiments on the infra-red transmission (absorption) spectrum of skin. In the first two groups living human skin has been used as the subject of the experiments. In the third group, skin from freshly amputated surgical specimens and epidermal layers of skin, obtained by blistering with cantharides plasters, were used.

Conclusion

The energy distribution curve of the radiation of the normal human skin has been found to correspond with that which would be expected of a physical black-body of the same temperature. The low reflecting and transmitting power of the skin for radiation in the region of the spectrum in which the skin radiates is further evidence in support of this conclusion. The visible color of the skin exerts no influence on its absorbing power in the infra-red. The absorption and emission of infra-red radiation occurs in the outer layers of the skin.

Book Reviews

MANIPULATIVE TREATMENT FOR THE MEDICAL PRACTITIONER by T. Marlin, M.D., M.B., Ch.B., D.P.H., R.C.P.S. (Eng.), D.M.R.E., Medical Officer in charge of the Massage, Electrotherapeutic and Light Departments, University College Hospital, London, Honorary Physician with charge of the Physiotherapeutic Department, Hampstead General Hospital, London. Cloth Pp. 133, 85 illustrations. Price, $3.75. New York, Longmans, Green & Co., 1934.

Recently considerable interest has been shown in the methods and results of manipulation. It is a part of physical therapy and has undoubtedly relieved many conditions which have resisted other methods of treatment. There is little literature on the subject, and this book meets a real need of the physical therapy technician who desires to understand manipulative therapy.

The author, in his special efforts to acquire the manipulative technic, visited the College of Osteopathy in Philadelphia. This book presents in excellent form some of the manipulations which he learned. Some of these manipulations should be used only by physicians, but many are useful to the physical therapy technician. The author states that manipulation is something different from massage, although the dividing line is not of a very definite nature. Thus, soft tissue manipulation, employed either as a therapeutic measure by itself, or as a preliminary to joint manipulations, may be looked upon as an adaptation of massage movements, and joint manipulation in many cases is simply an exaggeration of the movements which masseurs ordinarily use in the treatment of stiff joints. Marlin emphasizes that the various methods of pulling and gripping structures during manipulation do not come under the heading of massage and should be undertaken only by specially skilled persons.

The various types of manipulations are considered under four heads: 1. Reduction of dislocations. 2. Forcible breaking down of adhesions. 3. Soft tissue manipulations. 4. Manipulation of joints in which no actual dislocation has occurred, but where there is a slight defect of a nature difficult to describe.

The physical therapy technician is concerned in the treatment of all these cases, and it is often a great aid to the after treatment if the exact manipulation given by the physician is known by the technician administering the treatment. The soft tissue manipulations will often be carried out by the technician.

Under soft tissue manipulations Marlin gives technic for occipital traction often useful for headache, and an inhibitive pressure of the prenic nerve for hiccough. Five methods are given for scapular holds to restore free mobility to the scapula in the treatment of stiff shoulders. His three methods of overcoming the resistance of the Tendo Achilles, of manipulating the foot into forced inversion to open up the astragalo-calacneal joint, his methods of mobilizing the tarsal joints between the cuboid and the bases of the fourth and fifth metatarsal bones and the metatarsal-phalangeal joints are methods that are useful to anyone treating stiff, painful or flat feet.

Manipulations for all joints are given in detail and each technic is illustrated. As manipulation is a part of physical therapy, this book is an important addition to our technical library.

THE HEALTH WORKBOOK FOR COLLEGE FRESHMEN, by Kathleen Wilkinson Wootten. Publishers, A. S. Barnes & Company, New York. Price, $1.50.

The book is exactly what the title says it is. It is the result of seventeen years experimentation with a three hour college credit course for freshmen.

The introduction, which is written for the teacher of Health Education, presents the point of view of the author in regard to the meaning of health, the important points to consider in teaching health, the possible contributions of the various departments of a college to a Health Education program. It is briefly written and shows at once that the author is considering the Health Education Program in a very broad sense. She says, "Since every individual has a right to start life thoroughly oriented in the principles of healthful living and every citizen is directly responsible for his own health, the health of his family and his community, this course is planned to include the fundamental principles of personal, home, and community hygiene."

The rest of the book is for the student. After giving him very briefly a point of view from which to begin, Miss Wootten proceeds at once to the units of study. Each chapter represents a unit of work. Examples of these units are: "Preventive Medicine versus Superstition, Quacks, and Nostrums", "The Hygiene of Clothing", "Mental Hygiene". Each chapter is given in detailed outline form and represents a plan of work. It also has a blank page for additional notes and a long bibliography which includes both books and magazines and frequently the addresses of places to which one may send for materials of study. The student is led by means of these units into many fields of thought for fundamental information. These include: Personal Hygiene, Community Hygiene, First Aid, Preventive Medicine, History of Medicine, Anatomy, Physiology, Histology, Dietetics, Eugenics, and Home Care of the Sick.

It is the author's intention to get away from the text-book or lecture type of course, and to have instead an activity program. She suggests in addition to the necessary reading, charts to make, diagrams to label, drawings to complete, and surveys of college, city, or state health problems to make.

Miss Wootten's idea of what a health department should be is best given in her own words: "After all, a health department should be a coordinating department wherein scientific knowledge, ideals, and attitudes learned in all departments should be applied to daily problems of living."

Surgeons to Meet in Jacksonville, Fla.

The Southeastern Surgical Congress, through its secretary, Dr. B. T. Beasley, announces the sixth annual assembly of the Congress which will be held in Jacksonville, Florida, March 11, 12 and 13, 1935. The Congress has met previously in Atlanta, Birmingham and Nashville. The states composing the Congress are Alabama, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee and Virginia. A partial list of those who have already accepted places is as follows: Doctors Walter C. Alvarez, Perry Bromberg, Hugh Cabot, Willis C. Campbell, George W. Crile, John F. Erdmann, Paul Flothow, Ralph Green, Arthur Hertzler, C. Jeff Miller, Alton Ochsner, J. C. Patterson, J. Knox Simpson, J. W. Snyder and W. A. Weldon. More than twenty others will be listed when the program is completed. Look for the completed program which will be mailed about February 15, 1935.

For information address Dr. B. T. Beasley, Secretary-treasurer, 1019 Doctors Building, Atlanta, Georgia.

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